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Conflicts of interest

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Abstract

Estimates of the marginal productivity of the health sector are required for a wide range of resource allocation decisions. Founding these estimates on robust empirical analysis can inform these decisions and improve allocative efficiency as a result. This paper estimates the marginal productivity of the English NHS for a ten year period between 2003/04 and 2012/13. Data on expenditure and mortality by programme budget categories from this period are used in conjunction with socio-economic and demographic variables from the censuses from 2001 and 2011, as part of an econometric strategy that employs an established instrumental variable approach that is subjected to a number of sensitivity analyses. The results of the econometric analysis, along with additional data on burden of disease, are used to generate an estimate of marginal productivity. This paper finds that the point estimates of the amount of resources, in nominal terms, to produce an additional unit of health benefit has ranged from £5,000 to £15,000 per quality-adjusted life year between 2003/04 and 2012/13. These results are discussed in the context of the existing literature, and the potential policy implications for decisions about resource allocation are explored.

Keywords: productivity; econometric modelling; programme budgeting; health opportunity costs; allocative efficiency

1. Introduction

The UK's National Health Service (NHS) is one of the largest employers in the world, ranked 5th in 2015 according to Forbes magazine (McCarthy 2015). In 2003, public expenditure on healthcare for the UK was £92.6 billion (in 2015 prices, roughly 5.6% of GDP) compared to £125.7 billion in 2012 (in 2015 prices, roughly 7% of GDP)(Nuffield Trust 2015). Given the scale of the NHS, there is considerable interest in assessing the productivity of NHS expenditures and its evolution over time (Bojke et al. 2017).

Studies considering the productivity of healthcare tend to focus on estimating productivity with respect to a measure of output (an instrumental goal (Murray & Frenk 2000)), while only 9% of studies reviewed by Hollingsworth (2008) considered outcomes (intrinsic goals) such as 'health status, mortality or quality of care'. However, decisions around resource allocation within and between competing sectors, including health, are more appropriately guided by the productivity of sectors measured in terms of outcomes, since trading-off the value of outputs among all possible health system activities would seem not appropriate and trading-off outputs from different sectors would seem impractical. In this way estimates of productivity in terms of outcomes can be seen as relevant to notions of allocative efficiency, while output-based productivity estimates are more relevant to concerns about productive efficiency. For the purposes of informing allocative efficiency, productivity at the margin is most commonly the estimand of interest, since this reflects the additional beneficial outcome that could be gained with additional resource. Conversely, it also reflects the benefit foregone if resources are taken away from the sector. For allocation decisions within the health sector it reflects the benefit foregone if resources are committed to a specific type of expenditure and removed from the overall discretionary budget, and can be used to estimate health opportunity costs of new health technologies (Claxton, Martin, et al. 2015; Culyer 2018).

The relative abundance of studies estimating productivity in terms of outputs as opposed to outcomes stems from two main reasons. First, studies considering the performance of healthcare delivery generally do so to make comparisons between the productivity of institutions or to track the productivity of an institution or set of institutions over time (Smith & Street 2012). Having some way of keeping track of these measures, either publicly or privately, is important owing to the many inter-locking agency relationships that characterise healthcare systems of all designs (Propper 1995; Propper & Wilson 2012). For comparing productivity in this context, it is not necessarily essential to consider outcomes. Second, attributing outcomes to inputs, such as expenditures, can prove more challenging than attributing outputs to inputs. This is because the process determining outcomes is complicated with unknown causal mechanisms relating to environmental factors, in addition to the unknown relationship with the input of interest. Nevertheless, resource allocation decisions are made whether or not there exists empirical evidence regarding the marginal productivity of public sectors. In the absence of explicit estimates, decisions are made with implicit assumptions about what the marginal productivities might be. This means that it is vital that empirical analysis is conducted where possible using an appropriate and robust, although inevitably not perfect, methodology so that resource allocation decision making is evidence-based and accountable.

Estimating the causal link between healthcare expenditure and health outcomes is fraught with empirical challenges. Healthcare expenditure is usually linked by some mechanism to healthcare need that will usually be related to health outcomes. In addition, health outcomes are also determined in large part by environmental factors where the causal pathway may not be known (Hauck et al. 2016). In particular, when seeking to draw inferences from international comparisons, researchers might have failed to adjust for all the potential external influences on health outcomes. For example, Gravelle & Backhouse (1987) examine some of the methodological difficulties associated with empirical investigation of the determinants of mortality rates. These include

heterogeneity between observational units, simultaneous equation bias and the associated endogeneity problem (that the level of healthcare input might reflect unobservable factors that influence the level of health outcome achieved), and that a lag may occur between expenditure and outcomes (studies typically assume that expenditure has an contemporaneous effect on mortality). Because of these reasons, the failure to identify strong and consistent relationships between healthcare expenditure and health outcomes (after controlling for other factors) has become a recurring theme in the literature (Gallet & Doucouliagos 2017).

In a bid to overcome the econometric challenges associated with this kind of study, and to provide policy-relevant estimates of marginal productivity for national decision making, recent studies have increasingly started to employ instrumental variable-based (IV) regression approaches using sub-national data (Martin et al. 2008; Martin et al. 2012; Claxton, Martin, et al. 2015; Andrews et al. 2017; L C Edney et al. 2018a; L C Edney et al. 2018b). This presents considerable advantages over the use of aggregate country level data. The first is that the estimated effect has an intrinsic link to the parameter of interest, since the estimated coefficient reflects the average implications for health of variations in expenditure at the margin. Second, the use of sub-national data can reduce the likely aggregation bias suffered by estimates compared to international data. Third, analysis of sub-national data generally allows for the inclusion of a broader range of variables since numerous sources of data can be linked and available data is not constrained by the need for international comparability of data. Further, in an analysis using sub-national data from a single country, there is likely to be a much better understanding of the underlying data generating processes that can inform an identification strategy for the consistent estimation of causal effects.

Studies using sub-national data typically use local-level information on expenditure and outcomes, as well as healthcare need, environmental factors affecting health and potential IVs (Martin et al. 2008; Martin et al. 2012; Claxton, Martin, et al. 2015; Andrews et al. 2017; L C Edney et al. 2018a). For analysis of English data the local level in published papers has been the primary care trust (PCT), a health authority responsible for organising healthcare and meeting the healthcare needs of the local population. Two main approaches have been used to estimate the effect of healthcare expenditures in England, which differ in terms of how equations to be estimated are structured and also how the effect of expenditure on outcomes is identified using IVs.[1] One approach, Andrews et al. (2017), directly estimates the elasticity of all-cause mortality with respect to health expenditure. IVs are chosen on the basis that the per capita budget assigned to each health authority is the product of the national per capita budget and four adjustments reflecting local circumstances, where three of these might plausibly be unrelated to mortality. Using these three adjustments as IVs for total healthcare expenditure, Andrews et al. (2017) report an elasticity of all-cause mortality with respect to expenditure of -0.71 for 2005/06. The other approach, Martin et al. (2008 and 2012) and Claxton et al. (2015), uses national data on expenditure and outcomes in different disease areas (programme budget categories, PBCs) reported at a local level (primary care trusts, PCTs). An expenditure equation is estimated to quantify how the overall budget is allocated across PBCs, in addition an outcome equation is estimated to quantify the elasticity of PBC-specific mortality with respect to PBC-specific healthcare expenditure. The IVs used in this approach reflect factors, such as socio-economic deprivation and the availability of informal care in the community, which directly influence healthcare expenditures, but plausibly only indirectly impact on mortality rates through healthcare expenditure levels. This second strategy for finding IVs has generalisability beyond the English NHS and has been employed in the analysis of Australian data where an elasticity of all-cause mortality with respect to health expenditure of -2.2 is reported (L C Edney et al. 2018a; L C Edney et al. 2018b).

[1] A third approach has recently been explored, Claxton et al. (2018), which essentially employs an approach that is a hybrid of these two approaches employing the Andrews et al. (2017) approach to IVs for all expenditure in order to estimate elasticities for certain PBC-specific mortalities instead of all-cause mortality.

The elasticities of mortality with respect to expenditure are interesting results in themselves, but they do not fully express the marginal productivity of the NHS in the most useful way. This is because the NHS is not only concerned with life-saving care, but the improvement of health overall. Therefore, a measure of marginal productivity should ideally reflect the effect of NHS expenditures on extending survival (resulting from reduced mortality) as well as improving health-related quality of life. Combining estimated elasticities of disease-specific mortality with respect to disease-specific expenditures with additional information about age, gender and life expectancy of the patient population, Claxton et al. (2015) are able to express the mortality effects in terms of cost per life-year (£25 214 per life year for 2008/09 healthcare expenditures). Further, by using the effect of expenditure on the mortality and life-year burden of disease as a surrogate for the effects on a more complete measure of health burden (one that also includes morbidity burden), they express the result in terms of cost per QALY, which reflects the likely impact of expenditure at the margin on both mortality and morbidity (£12 936 per QALY for 2008/09 healthcare expenditures) (Claxton, Martin, et al. 2015).

This paper estimates the marginal productivity of the English NHS for a ten year period between 2003/04 and 2012/13 applying the methodology used in Martin et al. (2008 and 2012) and Claxton et al. (2015) to new data and conducting additional forms of sensitivity analysis. In so doing, a number of empirical challenges are overcome regarding the consistency of collection of data. The datasets used are described in section 2, along with an overview of the empirical approach and methods used. Discussions of specific methodological challenges are detailed in section 3. In section 4, marginal productivity results for the ten year period, point estimates and key percentiles of the distribution, are expressed in terms of the amount of resource used to produce a unit of health benefit (cost per QALY) and the amount of health benefits produced using a unit of resource (QALY per cost). Finally these results are discussed in section 5, before a conclusion is presented in section 6. Additional information on the detail of the methods outlined in the paper and results sensitivity analyses which were undertaken are presented as part of the Appendix.

2. Methods

2.1 Data

This paper uses two recently established data sets to examine the relationship between NHS expenditure and mortality rates for various disease categories. One data set contains mortality rates (standardised years of life lost rates, SYLLR) for various disease categories at the level of Local Authorities, LAs, in three year periods from 2003/04/05 to 2012/13/14. The other data set presents NHS expenditure (adjusted for unavoidable cost-factors) by geographically defined local health authorities, PCTs, on 23 broad programmes of care (PBCs). This data set embraces most items of publicly funded expenditure, including inpatient, outpatient and community care, and pharmaceutical prescriptions. A third source is used in this paper, namely UK censuses from 2001 and 2011. These census datasets contain a vast amount of information, including demographic and socio-economic variables, recorded at a number of geographic levels, including LAs for both years. Finally, additional information on the age, gender, life expectancy and health-related quality of life of the patient population is taken from ONS (2011) and WHO (2008).

A key challenge to empirical research with these data is establishing consistency in the definition of geographical areas across the different data sources. In order to understand this, it is worth exploring the policy context of the UK NHS from which most of these data derive. NHS revenue is generated almost entirely from national taxation, and access to the system is generally free to the patient. The system is organised geographically, with responsibility for the local administration of the NHS devolved to health bodies. These health bodies are allocated fixed annual budgets by the Department of Health and Social Care, within which they are expected to manage the healthcare in the locality. The precise nature of the health bodies to which responsibility is devolved has varied over recent years due to various policy reforms from successive governments. In 2003/04 responsibility was devolved to PCTs, of which there were initially 303, reducing to 152 in October 2006, until more recently in April 2013 when responsibility was transferred to 211 clinical commissioning groups (CCGs). In addition, responsibilities for expenditures on public health have been taken away from PCTs and instead devolved to local authorities (LAs) from 2012.

We obtain mortality data for LAs as opposed to PCTs. This is because mortality data (specifically the standardised years of life lost rate by PBC) is only available at PCT-level up until 2008/09/10 but is available for all ten years at LA-level. Census variables are available at LA-level from both 2001 and 2011. The remaining variables (PBC expenditure data, healthcare need derived from the UK Department of Health and Social Care resource allocation model based on the Combining Age-Related and Additional Needs formula (hereafter CARAN need), raw population, unified weighted population, market forces factor, and PBC-specific indices of need) are only available at PCT-level for all waves of data and so have to be mapped to LA-level using a UK Department of Health and Social Care tool.[2]

Taken together, a single dataset is produced that contains information on mortality and expenditure by PBC and measures of healthcare need, observed for all LAs over the ten year period. Socio-economic and demographic variables are only observed in 2001 and 2011 so values for all LAs 2003/04 – 2010/11 are calculated by linearly interpolating between these two observed values and 2011 values are used for 2011/12 – 2013/14.[3]

[2] Some PBC-specific measures of need are used in a select few disease areas, e.g. mental health, infectious diseases, and these are available only at CCG-level for 2012/13. In the 2012/13 analysis these measures of need were taken from 2011/12 values available at PCT-level. For the majority of PCTs there is no mapping issue because there is a one-to-one mapping of PCT to LA. The sensitivity of results to the mapping tool was investigated as part of preliminary work, using data from 2008/09 where both PCT-level and LA-level are available, and the results were largely robust to inaccuracies resulting from the mapping process (see Claxton et al., 2017).

[3] Index of Multiple Deprivation (IMD) is observed for each LA once according to the 2007 definition and once according to the 2010 definition. The former definition is used for 2003/04 – 2008/09 and the latter used for 2009/10 – 2012/13.

2.2 Descriptive statistics

In this section, descriptive statistics of the key variables are presented, averaging across the ten years as well as providing information on the extent of variation that exists between LAs and within LAs over time.

Table 1 - Descriptive statistics

Variable name	N	Mean	Min	Max	CV	SD	SD (between)	SD (within)	SD (within - excluding uniform time effect)
NHS expenditure - all cause	1520	1520.64	820.54	2456.31	0.22	331.11	198.19	265.68	91.14
NHS expenditure - cancer	1520	91.66	28.78	195.75	0.26	23.89	14.10	19.32	13.52
NHS expenditure - circulatory	1520	127.88	64.43	328.13	0.21	26.23	21.02	15.78	14.66
NHS expenditure - respiratory	1520	75.45	31.61	153.97	0.27	20.34	15.14	13.63	8.80
NHS expenditure - gastro-intestinal	1520	80.63	24.14	141.45	0.23	18.43	14.30	11.68	9.31
SYLLR - all cause	1504	457.55	198.66	790.42	0.19	85.17	81.98	26.86	22.26
SYLLR - cancer	1504	155.86	22.48	224.60	0.14	21.32	20.95	9.95	9.88
SYLLR - circulatory	1504	96.33	30.86	189.60	0.25	24.55	22.21	11.29	8.00
SYLLR - respiratory	1501	23.55	1.16	68.74	0.37	8.62	8.08	3.12	3.12
SYLLR - gastro-intestinal	1498	25.42	0.01	87.62	0.43	10.86	10.48	3.59	3.58
CARAN need index	1520	1.02	0.72	1.41	0.14	0.14	0.14	0.03	0.03

All NHS expenditures are adjusted for unavoidable variations in costs by LA. These descriptives are unweighted averages across all ten years, but LAs are quite heterogeneous in terms of population size. CV, coefficient variation, is calculated by dividing the standard deviation by the mean – it gives a standardised measure of variability. SD (within – excluding uniform time effect) was calculated as the within standard deviation after the raw values had been adjusted for year effects using a regression of the variable under consideration against indicators for each of the years.

The descriptive statistics reported in Table 1 indicate considerable variation in the key variables (mortality and expenditure) under consideration. The variation in CARAN need indicates considerable heterogeneity in the healthcare needs of LAs, although not to the extent of the key variables (comparing the coefficients of variation across variables). The standard deviation is broken down into between-variation (the variation between LAs) and within-variation (the variation over time within LAs). In most cases the variation between LAs exceeds the within-variation, except for the expenditure variables. Since expenditure is measured in nominal terms, and because there are potentially other year-effects beyond inflation that affect all LAs, a second estimate of within-variation is calculated where the variable is first adjusted for general year effects using an unweighted regression of the variable under consideration against indicators for each of the years. Following this adjustment the within-variation for all variables is less than the between-variation, by quite some margin in some cases, therefore exhibiting high levels of persistence over time for each variable.

2.3 Econometric strategy

Econometric analysis of the production of health can be informed by an explicit theoretical framework, which is useful in providing insight into an appropriate identification strategy. Many applications have in mind some model of individual health production, for example Gravelle & Backhouse (1987). Given that this analysis considers the English NHS with local administrative health bodies, we adopt the framework first described by Martin et al. (2008). In short, this model assumes that decision-makers allocate a fixed budget across programmes of care, in such a way that the health production function for each programme of care is considered, maximising a social welfare function that is a function of health outcomes. The key insight from this model is that the optimal level of spending for a given disease area is a function of overall expenditure, need for healthcare spending in that disease area, environmental factors that affect health in that disease area, as well as need for healthcare spending and environmental factors that affect health in other disease areas. Health within each disease area is assumed to be a function of healthcare expenditure within that specific disease area such that, for example, cancer outcomes do not depend upon expenditures on circulatory problems, and there are no direct health effects of cancer expenditures beyond cancer outcomes. In addition, following one of the insights of Gravelle & Backhouse (1987), expenditure within each outcome equation may be endogenous due to simultaneous equation bias, i.e. the level of healthcare expenditure within a disease area might reflect unobservable factors that influences the level of health outcome achieved in that disease area.

The theoretical framework of Martin et al. (2008) suggests the specification and estimation of a system of equations, with an expenditure and health outcome equation for each of the 23 programmes of care. However, this approach makes infeasible data demands, requiring variables to identify expenditure, need, environmental factors and health outcomes in each of the 23 programmes of care. Moreover, mortality rates are available for less than half of the 23 programmes. Rather than estimate a system of equations, we proceed on a programme-by-programme basis, estimating health outcome and expenditure equations for those programmes for which mortality data are available following the strategy adopted in Claxton et al. (2015).

In line with the theoretical framework summarised above, we specify the following expenditure (see Equation 1) and health outcome (see Equation 2) models for each of the 23 programmes of care. Accordingly, for the j-th programme of care we have:

$$x_i = \beta_0 + \beta_1 n_i + \beta_2 m_i + \beta_3 y_i + \varepsilon_i \quad (1)$$

$$h_i = \gamma_0 + \gamma_1 n_i + \gamma_2 x_i + \omega_i \quad (2)$$

All variables are log-transformed prior to estimation. The i subscript denotes the unit of observation, (LA), y is overall expenditure, h is mortality in the j-th PBC, x is the expenditure on the j-th PBC, n is the need for healthcare in the j-th PBC, m is the need for care in other PBCs, β and γ arguments are parameters to be estimated (β_3 is referred to as an 'expenditure elasticity' and γ_2 an outcome elasticity), and ε and ω are error terms.

It may be the case that m in equation 3 and x in equation 4 are endogenous, since other programme need is proxied using mortality rates and expenditure by a LA on a disease area may be related to unobservable factors that influence the level of health outcomes. For this reason, OLS estimation of equations 1 and 2 would likely result in bias even if analysis controlled for observable healthcare need (n). One approach to controlling for this endogeneity problem is to estimate IV regression using suitable IVs (Martin et al. 2008; Martin et al. 2012; Claxton, Martin, et al. 2015; Andrews et al. 2017; L C Edney et al. 2018a). However, the underlying theory that suggests endogeneity is likely does not itself give any insight into specific instrumental variables that should be used. In general,

we need instruments that are associated with either PBC-specific expenditure or other-PBC mortality (this requirement is referred to as 'instrument relevance'), but not PBC-specific mortality either directly or through some unobserved variable (this requirement is referred to as 'instrument validity'). Instrument relevance can be directly tested, typically by requiring an F-test of excluded instruments in the first stage and requiring that the test statistic exceeds 10 (Staiger & Stock 1997). Instrument validity cannot be directly tested, and expert judgement is required, but when an equation is over-identified (there are more excluded instruments than endogenous variables) then an over-identification test can be helpful, although it may lack power in rejecting the null hypothesis of joint validity in some cases (Kovandzic et al. 2013).[4] In some cases we can more appropriately invoke expert judgement than others. For example, given knowledge about social determinants of health, it would be not appropriate to rule out the possibility that socio-economic and demographic instruments are invalid in the context of an all-cause mortality where control variables are not used. Indeed there is a vast literature on the observed associations between socio-economic status and all-cause mortality e.g. Hauck et al. (2016). In the context of this paper, where control variables (n) are used and it is not all-cause mortality but rather PBC-specific mortality, it is less clear the extent to which it is possible to know a priori which instrumental variables will be valid. Although for some PBCs there may be concern about the role of risk factors such as smoking and their association with socio-economic status, generally speaking the mechanisms of cause and effect underlying the observed associations between socio-economic status and PBC-specific mortalities are largely unknown. Nevertheless, the likely presence of endogeneity suggests that we should attempt to use some econometric approach beyond OLS, such as IV regression, in order to obtain consistent estimates of the causal effects. As such we rely on an approach where we are guided by statistical tests in addition to a priori plausibility that instruments could be valid.

With 10 years of data available, a number of possible research avenues initially present themselves. It is observed in section 2.2 that there is greater between-variation than within-variation. This means that it will inevitably be challenging to isolate causal effects from within-variation. Any research strategy based on an IV approach given the available data is made even more difficult, since the IVs have only two different observed values over the 10 years (2001 and 2011). As such it is more appropriate to focus on the possibility of identifying the causal estimates using the between-variation. Given that the patient population for each wave of data is, to some extent, different it makes sense that the model specification may vary between years with different determinants of PBC-specific mortality and PBC-specific expenditure. As such we analyse each wave of data separately as a cross-section. This approach enables the identification of any evolution over time in the relationships between overall budget and expenditures, and outcomes and expenditures for each PBC.

2.4 Translating mortality effects into life-years and quality-adjusted life-years

The same approach to using estimated elasticities to produce an overall estimate of cost per QALY for marginal productivity is adopted as in Claxton et al. (2015). This used additional information from WHO and ONS data sources in addition to assumptions about how the effect of expenditure can be estimated for improvements in health-related quality of life, in addition to reductions in mortality for PBCs without a mortality outcome variable. These assumptions, referred to as surrogacy and

[4] The Hansen–Sargan J test of overidentifying restrictions calculates whether different instruments or different combinations of instruments generate significantly different values for the coefficient (β_2 in equation 1 and $\gamma_2$in equation 2) on the endogenous variable in the equation of interest. If significant differences are detected then the test will reject the null hypothesis that all instruments are jointly valid. Even if all of the instruments are invalid in the sense that they are all correlated with the error term in the equation of interest, the test can detect this failure if the induced biases in the estimates of β_2 or γ_2 differ across instruments. The test can have low power, i.e. not reject when IVs are not valid, if the biases induced in $\widehat{\beta_2}$ or $\widehat{\gamma_2}$ by invalid instruments all coincide (i.e. the instruments all identify the same wrong parameter) (Kovandzic et al. 2013; Claxton et al. 2015).

extrapolation[5] respectively have been the subject of critical discussion (Barnsley et al. 2013) with recent research by Soares et al. (2018) suggesting that on balance they are likely to underestimate the health effects of healthcare expenditure (and therefore overestimating cost per QALY).

[5] The extrapolated elasticity is calculated differently in this paper compared to Claxton et al. (2015). Claxton et al. (2015) calculate a weighted average of the estimated outcome elasticities using change in expenditure to weight the different PBC elasticities. In contrast, we calculate an elasticity to extrapolating by simulating a 1% change in expenditure allocating across PBCs via the estimated expenditure elasticities and estimating the absolute reductions in mortality from the change in expenditure. This is then calculated as a percentage reduction in overall mortality and this value is used as the elasticity to be extrapolated to other PBCs without mortality indicators (Claxton et al. 2017a).

3. Methodological challenges

The approach outlined in section 2.3 was followed for all of the 310 equations estimated for each of the ten years of data. In order to provide more detail on some of the methodological challenges, three key issues are highlighted here with additional description of the analysis undertaken.

3.1 Determining an appropriate econometric specification

Each wave of data was analysed separately, and the model was specified for each year according to the following method. In the first instance the econometric specification was taken from the most relevant precedent available beginning with 2009/10 drawing upon the 2008/09 specification derived in Claxton et al. (2015).[6] This specification was then subjected to a battery of statistical tests: if IV specification - endogeneity test, Hansen-Sargan over-identification test (when multiple IVs used), Kleibergen-Paap LM test for instrument relevance and the Pesaran-Taylor test for misspecification; if OLS specification - RESET test. In addition, the model is assessed according to plausibility with respect to two priors: that expenditure reduces mortality ($\widehat{\gamma_2} < 0$) and that expenditure on a given PBC increases with overall budget ($\widehat{\beta_3} > 0$) and decreases with other PBC need ($\widehat{\beta_2} < 0$). If there was no evidence that the model was not appropriate based on these tests, then the estimate was used to form part of the overall result. If any of the tests indicated that the model was not appropriate, then the specification was first amended according to the specific test failed, and if this was not sufficient then the entire equation was re-estimated with covariates and instrumental variables selected using a step-wise procedure. In rare circumstances where outlier expenditure values were found, samples were trimmed as a final attempt to estimate a successful model. If this failed then either a value of zero is used if an outcome elasticity, or, if an expenditure elasticity, the preceding wave's specification was adopted and the estimate used irrespective of test results and coefficients not conforming to priors. The outcomes of this process were preferred outcome and expenditure specifications for each PBC for each year. More details of this process and are provided in the Appendix, section A1.1.

3.2 Sensitivity of alternative OLS results to endogeneity

As mentioned in section 3.1, a test for endogeneity is performed for estimated IV regression models, and a RESET test is performed for estimated OLS models. Both of these tests can be used to inform the presence of endogeneity. However, testing a variable within an IV regression model for endogeneity, with the null hypothesis that the variable is exogenous, relies upon the model being correctly specified. While there are tests for misspecification and the validity of IVs, it cannot be known with certainty that the model specification is correct. Likewise, the RESET test only provides an indication as to whether there is model misspecification or not, which in turn would indicate the presence of endogeneity.

As a result the presence of endogeneity is not possible to detect using statistical tests alone, but instead a judgement informed by theory is required. In the context of estimating the relationship between mortality and healthcare expenditure, there is a long history of empirical work that has attempted to control for endogeneity (Gallet & Doucouliagos 2017) and theoretical papers that suggest that endogeneity is likely (Gravelle & Backhouse 1987). To illustrate the implications of not employing an IV approach, a sensitivity analysis is conducted where all equations are estimated using OLS. The results for 2012/13 are discussed in detail in the Appendix, section A1.2, and are briefly summarised here. In the analysis of the 2012/13 data, 10 expenditure equations and 5 outcome equations were estimated using IV regression. In all cases, not using IVs and estimating

[6] FY 2010/11 then drew upon the econometric specification from FY 2009/10, and so on, up to 2012/13. The model specification for 2008/09 drew upon that for FY 2009/10, and then that for FY 2007/08 drew upon FY 2008/09 and so on until each an appropriate model was specified for each wave of data as far back as FY 2003/04 and up to FY 2012/13.

using OLS results in a reduction in the magnitude of the point estimate of the coefficient of interest. In addition, when using OLS, there is no evidence of a statistically significant effect of own-PBC healthcare spending on cancer, respiratory and gastro-intestinal mortality. Considering all of the elasticities from these models estimated by OLS as well as all other equations estimated using OLS in the main analysis, an estimate of the implied all-cause mortality elasticity can be calculated. The implied all-cause elasticity estimate from the main analysis for 2012/13 was -1.028, which is comparable in magnitude to other all-cause mortality elasticity estimates of -0.71 (Andrews et al. 2017) and -1.089 (Claxton et al. 2018).[7] On the other hand, when all equations are estimated by OLS the resulting implied all-cause mortality elasticity is -0.153. The difference between the 2012/13 implied all-cause mortality elasticity estimate and the expected value from the existing literature reflects that OLS estimates underestimate the magnitude of effect of healthcare spending on mortality.

3.3 Sensitivity of IV results to just-identified IV approach

The issues caused by employing a weak set of IVs, with little relevance in the first-stage regression, are well-known, namely that it leads to bias in the IV regression coefficient. The approach adopted in this paper avoids this issue by choosing the model specification in accordance with statistical tests judged against conventional levels, i.e. first stage F-statistic of excluded instruments should be greater than 10 (Staiger & Stock 1997). In addition, it has been argued that a more parsimonious specification of IVs is better and that additional IVs, when individually adding little by way of explanatory power in the first-stage regression, increase large-sample bias of the IV regression coefficients (Breusch et al. 1999; Hahn & Hausman 2002; Andrews et al. 2017). As a rule, this paper does not include IVs in the first-stage regression if they are individually not significant and so does seek a parsimonious specification in this sense. More recently, some authors have gone further by saying that potential weak instrument bias can be mitigated by using a just-identified specification, i.e. including only a single IV in the case where there is a single endogenous regressor (Angrist & Pischke 2009). Specifically, Angrist and Pischke (2009) argue that just-identified IV is "approximately unbiased" with low median bias even with relatively weak instruments. In the main analysis of this paper, only IVs with significant individual and joint explanatory power are included in the first stage regressions of preferred specifications, but as a sensitivity analysis over-identified IV regression models were instead estimated using a just-identified approach. This resulted in negligible changes for the 2012/13 analysis of four large PBCs, results in Appendix section A1.3.

[7] Both of these results are based on 2005/06 expenditure data and 2005/06/07 mortality data. These studies are not directly comparable, because they do not analyse individual PBCs, but instead estimate a model relating all-cause mortality and all healthcare expenditure. As such we might expect that there is an underestimate in the magnitudes of these resulting estimated elasticities due to 'aggregation bias', i.e. in these studies it is harder to obtain a clear signal from the noisy data.

4. Results

Full regression results for the preferred outcome and expenditure equation specifications by PBC for each year, including specification test results, can be found in the Appendix section A2.2, Tables A2.1 – A2.20. First stage regressions of IV models can be found in the Appendix section A2.3, Tables A2.21 – A2.40. We summarise the outputs from each equation estimated by presenting the coefficient of interest in Table 2.

These estimated elasticities are combined along with additional information about age, gender, life expectancy and burden of disease of the patient population to produce overall results that can be presented as either the amount of resource used to produce a unit of health benefit (cost per QALY) or as the amount of health benefits produced using a unit of resource (QALY per cost). For the latter, we present results as the number of QALYs gained for £10 million, which represents a small amount of money relative to the overall level of NHS expenditure, but is large enough to produce a large number of QALYs. All results are expressed in nominal terms, meaning that the 2009/10 estimate of marginal productivity is denominated in 2009/10 prices. The results can be found in Table 3 and in Figures 1 and 2.

In Table 3 we present results in both formats. Results are generated first deterministically, where the point estimate of expenditure and outcome elasticities are used as inputs in the model that links these to ONS and WHO data in order to calculate overall estimates of marginal productivity. In the other columns, results are presented from a probabilistic analysis. For this, draws are taken from independent Normal distributions for each elasticity parameter with mean and variance taken from the estimated coefficient and standard error squared, respectively. In total, 20,000 iterations are conducted to generate a probability distribution for the overall result. The mean, 5th and 95th percentiles of the generated distribution are presented in the table above to reflect the point estimate and a 90% confidence interval.[8] This confidence interval reflects the parameter uncertainty in the model that is driven by sampling uncertainty and is driven entirely by the standard errors of the estimated expenditure and outcome elasticities. To this extent it reflects the effect that variations in estimated elasticities would have on the overall estimates of marginal productivity. The confidence interval does not therefore reflect other sources of uncertainty arising from more structural matters such as assumptions relating the effect of expenditure on mortality to the effect of expenditure on morbidity, or indeed the bias resulting from IV regressions with contaminated IVs (IVs that are not perfectly valid).

These same results are plotted visually in Figures 1 and 2. Figure 1 presents the deterministic point estimate in terms of cost per QALY along with the 90% confidence interval, while Figure 2 presents the deterministic point estimate in QALYs per £10 million along with the 90% confidence interval.

[8] The deterministic and probabilistic point estimates differ because of the non-linear function that combines the estimated elasticities and additional information about survival and health-related quality of life. In particular, two features of the model are responsible for the non-linearity: the extrapolation assumption, and the adjustment to expenditure elasticities so that the changes in expenditure in all PBCs sum to the overall change in expenditure simulated (1% of total expenditure).

Table 2 - Estimated outcome and expenditure elasticities, by PBC, 2003/04 to 2012/13

PBC	2003/04		2004/05		2005/06		2006/07		2007/08		2008/09		2009/10		2010/11		2011/12		2012/13	
	Out	Exp	Out	Exp	Out	Exp	Out	Exp	Out	Exp	Out	Exp	Out	Exp	Out	Exp	Out	Exp	Out	Exp
Infectious diseases	-0.205	1.094***	-0.100	0.932***	-0.432	1.205***	-0.608	1.051***	-0.660**	1.387***	-0.549***	1.471***	-0.310*	0.968***	-0.256	1.006***	-0.305***	0.841***	-0.362***	0.749***
Cancer	-0.201**	1.711***	-0.224**	1.259***	-0.159*	1.592***	-0.239***	1.219***	-0.273***	1.626***	-0.287***	0.784**	-0.345***	0.502**	-0.220***	0.438	-0.430***	0.961**	-0.361***	1.027**
Blood	n/a	0.652*	n/a	0.952***	n/a	1.486***	n/a	1.037***	n/a	1.374***	n/a	0.995***	n/a	1.060***	n/a	0.332	n/a	0.876***	n/a	1.119***
Endocrine	0	0.653***	-1.843	0.573***	-1.035	0.663***	-1.464	0.630***	-1.491	0.455***	-1.607**	0.498***	-1.075**	0.708***	-0.174	0.696***	-0.199	1.116***	-0.499	0.951***
Mental health	n/a	1.333***	n/a	0.999***	n/a	0.991***	n/a	1.143***	n/a	1.103***	n/a	0.995***	n/a	0.899***	n/a	0.973***	n/a	1.194***	n/a	1.023***
Learning disability	n/a	0.646*	n/a	0.446*	n/a	0.449*	n/a	0.410	n/a	0.386	n/a	0.329	n/a	0.647**	n/a	1.208**	n/a	0.741*	n/a	0.000
Neurological	-0.751*	1.408***	-0.968**	0.929***	-0.325	1.220***	-0.869*	0.382*	-0.237*	0.733***	-0.304	0.897***	-1.357	0.850***	-0.374	0.557***	-1.415	0.703***	-0.009	0.856***
Vision	n/a	0.833***	n/a	1.350***	n/a	1.127***	n/a	0.931***	n/a	1.106***	n/a	0.701***	n/a	0.934***	n/a	0.997***	n/a	1.279***	n/a	1.411***
Hearing	n/a	0.694*	n/a	0.526	n/a	0.762**	n/a	0.989**	n/a	0.951*	n/a	1.637***	n/a	1.273***	n/a	0.808*	n/a	1.231***	n/a	1.523***
Circulatory	-1.202***	1.873***	-1.375***	1.652***	-1.637***	1.477***	-1.404***	1.578***	-1.315***	1.614***	-1.384***	1.784***	-1.842***	0.494*	-1.692***	1.013***	-1.611***	1.491***	-1.464***	1.285***
Respiratory	-1.666***	1.661***	-2.494***	1.253***	-2.217***	1.225***	-2.281***	1.287***	-1.564***	1.555***	-1.671***	0.752**	-2.103***	0.576***	-2.006**	1.192***	-1.743***	1.360***	-1.704***	0.928***
Dental	n/a	0.717*	n/a	0.848*	n/a	1.224**	n/a	0.835**	n/a	0.420***	n/a	0.428**	n/a	0.765***	n/a	0.229	n/a	0.843***	n/a	0.855***
Gastro-intestinal	-1.493***	1.409***	-1.253***	0.928***	-1.014*	1.076***	-1.255**	1.014***	-0.837**	1.490***	-1.146**	0.520*	-1.989*	0.387*	-1.425**	1.040***	-2.000**	1.033***	-1.904**	0.997***
Skin	n/a	0.700***	n/a	0.595***	n/a	0.840***	n/a	0.701***	n/a	0.787***	n/a	0.907***	n/a	0.890***	n/a	0.422*	n/a	0.681***	n/a	1.158***
Musculo-skeletal	n/a	1.014***	n/a	0.567***	n/a	0.935***	n/a	0.628*	n/a	0.733***	n/a	0.738***	n/a	0.295	n/a	0.489**	n/a	0.456**	n/a	0.725***
Trauma and injuries	0	0.556***	0	0.576**	0	0.897***	0	0.705***	-0.638	1.328***	0	1.344***	0	1.090***	-0.064	0.589**	0	1.024***	0	1.058***
Genito-urinary	-0.063	0.934***	-0.931*	0.716***	-0.869*	1.079***	-0.588	0.988***	-1.977	1.015***	-0.024	0.733***	-2.997	0.878***	-2.83	0.631***	-0.494	0.598***	-0.160	0.855***
Maternity and neonates	0	0.757***	-0.121	0.678***	-0.056	0.865***	-0.085	0.614**	-0.057	0.563**	-0.030	0.963***	-0.166*	0.653***	-0.04	0.342	-0.136	0.481***	-0.106	0.833***
Poisoning	n/a	2.327***	n/a	1.674***	n/a	1.735***	n/a	1.107***	n/a	1.674***	n/a	2.102***	n/a	0.658**	n/a	1.078**	n/a	0.631**	n/a	1.124***
Healthy individuals	n/a	1.538**	n/a	0.709*	n/a	0.507	n/a	0.709	n/a	1.296**	n/a	1.049	n/a	1.246**	n/a	1.359**	n/a	1.748***	n/a	1.172*
Social care	n/a	1.581***	n/a	1.313**	n/a	1.069*	n/a	1.702***	n/a	1.669**	n/a	1.192*	n/a	0.844	n/a	1.592**	n/a	1.859***	n/a	1.613***
Other	n/a	0.681***	n/a	0.337***	n/a	0.532***	n/a	0.447***	n/a	0.553***	n/a	0.338***	n/a	0.564***	n/a	0.520***	n/a	0.518***	n/a	0.585***

Table 3 - Marginal productivity for 2003/04 to 2012/13

		Point estimate (deterministic)	Point estimate (probabilistic)	5th percentile	95th percentile
2003/04	**Cost per QALY**	£6,381	£6,381	£5,048	£8,534
	Health opportunity costs of £10mn (QALYs)	1,567	1,567	1,172	1,981
2004/05	**Cost per QALY**	£5,389	£5,377	£4,110	£7,517
	Health opportunity costs of £10mn (QALYs)	1,856	1,860	1,330	2,433
2005/06	**Cost per QALY**	£7,613	£7,635	£5,611	£11,619
	Health opportunity costs of £10mn (QALYs)	1,314	1,310	861	1,782
2006/07	**Cost per QALY**	£6,844	£6,838	£5,139	£9,878
	Health opportunity costs of £10mn (QALYs)	1,461	1,462	1,012	1,946
2007/08	**Cost per QALY**	£9,747	£9,765	£7,689	£13,043
	Health opportunity costs of £10mn (QALYs)	1,026	1,024	767	1,301
2008/09	**Cost per QALY**	£12,960	£13,271	£8,390	£32,881
	Health opportunity costs of £10mn (QALYs)	772	754	304	1,192
2009/10	**Cost per QALY**	£9,887	£9,920	£6,802	£17,296
	Health opportunity costs of £10mn (QALYs)	1,011	1,008	578	1,470
2010/11	**Cost per QALY**	£10,225	£10,214	£7,073	£17,153
	Health opportunity costs of £10mn (QALYs)	978	979	583	1,414
2011/12	**Cost per QALY**	£8,997	£8,985	£6,520	£13,945
	Health opportunity costs of £10mn (QALYs)	1,112	1,113	717	1,534
2012/13	**Cost per QALY**	£14,410	£14,411	£11,182	£19,861
	Health opportunity costs of £10mn (QALYs)	694	694	504	894

It can be seen from Table 3 and Figures 1 and 2 that the expected health opportunity costs of £10 million have decreased between 2003/04 and 2012/13 and so the cost per QALY ratio has risen. Nevertheless, all point estimates are within the range £5,000 to £15,000 per QALY. In addition, changes in the overall estimates of health opportunity costs of £10 million do not decrease monotonically with time, despite these results being nominal and inflation in NHS price levels during this period[9](Curtis 2014). From these results, where the uncertainty associated with these estimates is shown, it can be judged to what extent any changes in the point estimate between years should be interpreted as a signal of any trend. It is hard to conclude that there is a significant change in the health opportunity costs of £10mn expenditure, since there is a great deal of overlap between the 90% confidence intervals of the years shown. It can also be seen from Figures 1 and 2 that while the confidence interval is far from symmetrically distributed around the point estimate of the cost per QALY ratio in Figure 1 (where uncertainty is reflected in the denominator), the distribution of uncertainty of health opportunity costs per £10mn is much more symmetric in Figure 2 (since uncertainty is reflected in the numerator).

[9] HCHS index has grown over this period by 28%.

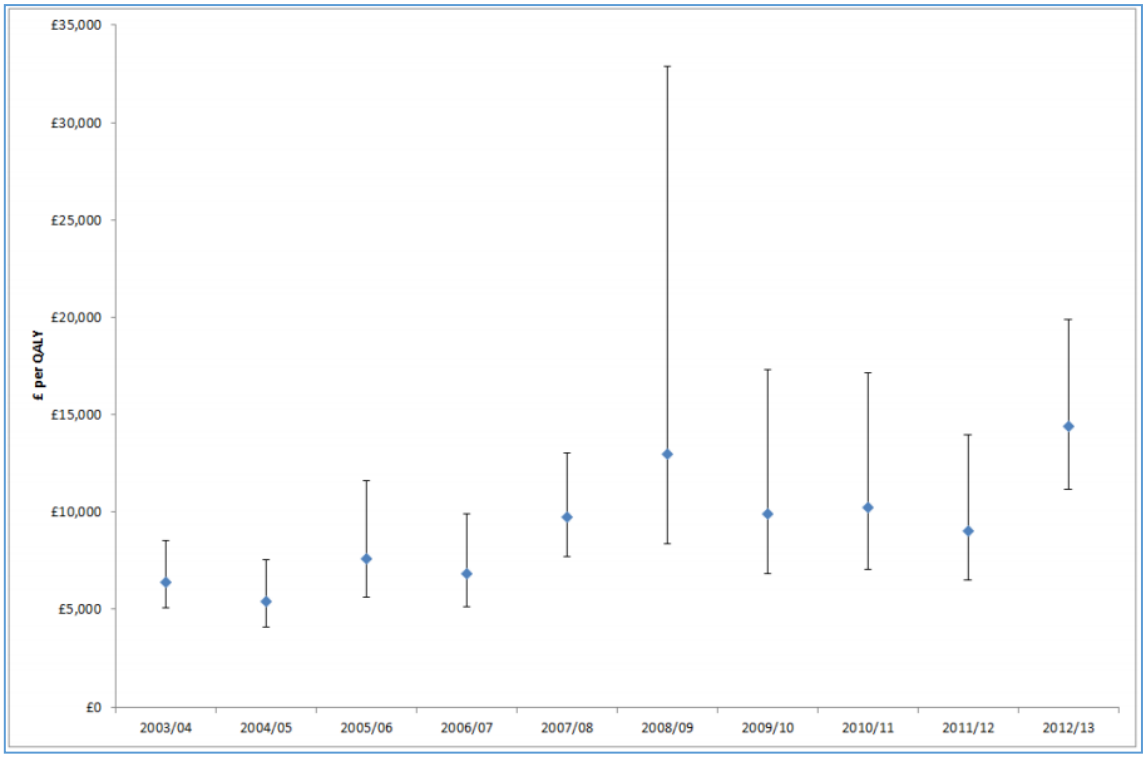

Figure 1 - Marginal productivity for 2003/04 to 2012/13 expressed as cost per QALY with 90% confidence intervals

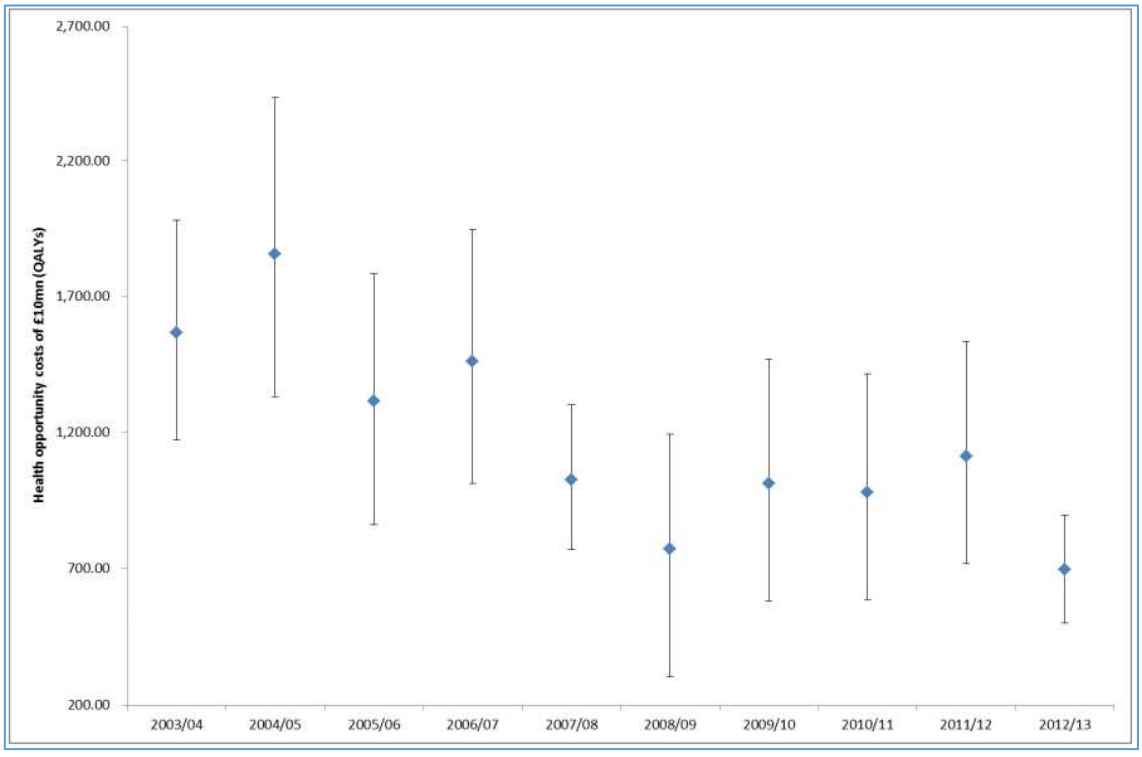

Figure 2 - Marginal productivity for 2003/04 to 2012/13 expressed as QALYs per £10 million with 90% confidence intervals

5. Discussion

Broadly speaking the results here confirm those of Claxton et al. (2015), which showed that the point estimate of the marginal productivity of the NHS was between £10,000 and £15,000 per QALY for the years 2006/07 to 2008/09. This paper contributes to the literature by extending the number of years analysed including much more recent estimates for the marginal productivity of the NHS for 2012/13. This is only possible due to work establishing the consistency in the unit of analysis to LA-level. In addition, this paper uses more appropriate IVs, by combining values from the 2001 and the (more recently released) 2011 censuses. Finally this paper describes a process by which precedent in the literature addressing this research question can be taken and used to inform a model specification for newly available waves of data, in accordance with the appropriate econometric specification tests.

Looking at the confidence intervals presented in Figures 1 and 2 it can also be seen that the results indicate that it can be said with some confidence that marginal productivity is above 300 QALYs for £10 million of NHS expenditure (£33,333 per QALY) where all years' results 5th percentile of QALYs per cost is above this value. Where resource allocation decisions have been made on the implicit basis that the estimate of marginal productivity of the NHS is £30,000, or even £40,000 per QALY, these decisions may have been sub-optimal as a result in terms of population QALYs (Claxton, Sculpher, et al. 2015). QALYs may of course not be the sole objective of healthcare expenditure, and decisions may be made that lead to reductions in health (as measured by QALYs), but are judged worthwhile because of other considerations. A framework for analysis to inform decisions such as these is illustrated in Sculpher et al. (2017).

Comparisons of these results with the broader literature on productivity is problematic given the emphasis here is on the marginal productivity of the NHS and not the average productivity. Studies from other healthcare systems vary widely in terms of methods used, but produce results where the estimated marginal productivity is lower than the value implied by healthcare decision makers (Ochalek et al. 2015; Vallejo-Torres, García-Lorenzo, Castilla, et al. 2016; Vallejo-Torres, García-Lorenzo & Serrano-Aguilar 2016). In this sense, this paper is consistent with the existing literature with marginal productivity estimated to be much lower than currently explicitly stated norms (NICE 2013) or the values implied by actual decisions (Dakin et al. 2014). Looking at the results from this paper over time, the cost per QALY in 2012/13 is more than double that of 2003/04, but some of this increase is no doubt due to input price inflation faced by the NHS, roughly 28% over the same period (Curtis 2014). Nevertheless, this suggests that real productivity at the margin has fallen, which is consistent with diminishing marginal returns to health expenditure (expenditure has increased in nominal and real terms over most of the ten year period analysed) (Nuffield Trust 2015). This may appear counter-intuitive given the finding from Bojke et al. (2017) that average productivity has increased over the same period, but could be explained by a number of factors: first, Bojke et al. (2017) use a composite indicator of outputs, as opposed to focusing on outcomes; second, the difference in results may reflect the kinds of marginal activities that are subject to disinvestment and investment locally - where different productivity trends may exist compared to the average; third, the kinds of activities that are marginal may change over time due to changes in demand for healthcare; and fourth, falling marginal productivity and rising average productivity is consistent if marginal productivity remains above average productivity. The issue of factors that may affect marginal productivity over time is discussed in more general terms by Paulden et al. (2017), where the general productivity of the healthcare system is just one factor in determining the marginal productivity that is crucial for decisions around resource allocation.

At the core of this analysis is the econometric estimation of expenditure and outcome elasticities. Since there are good reasons to believe that certain variables will be endogenous, a key component

is the use of IVs to identify a causal effect. It is generally impossible to know with certainty whether IVs are valid. Our theoretical model itself does not give insight into specific instrumental variables that should be used and their validity cannot be directly tested so judgement is required. In some cases we can more appropriately invoke expert judgement than others. For example, given knowledge about the social determinants of health, it would be not appropriate to rule out the possibility that instruments are invalid in the context of all-cause mortality where control variables are not used. Indeed we would argue that such instruments would not be valid with this setup, based on the literature on the observed associations between socio-economic status and mortality. In the context of this paper, where control variables are used and it is not all-cause but PBC-specific mortality that is being estimated, it is less clear the extent to which it is possible to know a priori which instrumental variables will be valid, i.e. those that are not part of the causal pathway. This is because the mechanisms of cause and effect on specific types of PBC mortality underlying the observed associations between socio-economic status and all-cause mortality are largely unknown.

It is possible to conduct statistical tests that can guide model specification and these have been used throughout, as part of a clearly specified and documented protocol before the analysis is undertaken to avoid the danger of mining alternative specifications (see Appendix A1.1). Nonetheless, the tests for validity can lack power to reject the null that IVs are not appropriately excluded from the second stage of the IV regression, in particular when IVs might be thought to influence the endogenous regressor in the same kind of way. However, the results of the just-identified sensitivity analysis and the poor performance of an OLS strategy, combined with other related work provides some greater confidence and insight into how these considerations might influence a reasonable interpretation of the results in this paper. Firstly, Claxton, Martin, et al. (2015) a sensitivity analysis (based on Small, 2007, and Conley et al., 2012) was undertaken to examine the impact of contaminated IVs (IVs that are not perfectly excluded from the second stage of the IV regression) which showed that contamination introduces additional uncertainty into the elasticity estimates, but not bias. Secondly, the implied all cause elasticities using the approach taken to identification in this paper are comparable with the directly estimated all cause elasticities in Andrews et al (2017) and Claxton et al (2018). The elasticities for key PBCs are also comparable with Claxton et al (2018). The fact that results are very similar when a very different approach to identification is taken gives some greater confidence that the census based instruments are plausibly valid and the results are not highly specific local average treatment effects. This is especially important in the more common context where the approach pioneered by Andrews et al (2017) is not possible. Taken together these considerations provide reassurance that an IV strategy is appropriate and that the estimates provided in this paper are not significantly biased in any particular direction. It does suggest that there is inevitably additional structural uncertainty that is not reflected in the confidence intervals reported in Table 2 and Figures 1 and 2.

The approach taken here is to analyse each wave of data as an independent cross-section and to build on the model specification from the preceding wave. As a result, these models represent the best specification for the data given the results of the statistical tests and therefore have better econometric properties. For example, maximal bias in IV models is reduced with a higher magnitude of first stage F-statistic (Stock & Yogo 2002). Further, each wave of data represents a different patient population with different determinants of health and healthcare demand. As a result, it is reasonable to expect the most appropriate econometric specification to vary between different waves of data. Practically speaking however, there is limited within-variation in the key variables as seen from Table 1 and high persistence over time is exhibited. As such, it is no surprise that relatively few changes to model specifications are required and that the estimated elasticities are reasonably stable over time.

For future work, there are a number of benefits to estimating a model across multiple waves of data using panel data analysis. The benefits of increased precision from using both within and between variation in variables are likely to be limited given that there is little within-variation in this context. In particular, identifying a causal effect using a fixed effects panel model would seem highly challenging. However, there may be value in pooling the data and estimating a single model over the multiple years of data. One potential concern with the work that is undertaken in this paper is that overfitting is introduced by adjusting specifications between years where variations may reflect noise as opposed to signal. The consequence of such overfitting would be that parameter uncertainty is underestimated. A panel analysis could be used to inform a single specification that is then applied to each wave of data, without refinement, thus avoiding charges of overfitting the data. Further, it may be possible to estimate the time profile of the lagged relationships between health and expenditure, which cannot be estimated in a study such as this that restricts analysis to current expenditures and current health outcomes.

6. Conclusion

Given the interest among economists in decision-making at the margin, and the longstanding interest in the productivity of publically funded institutions like the NHS, it is surprising that so few studies have sought to estimate the marginal productivity of the NHS. Its usefulness is not limited to decisions within the healthcare sector, but is essential to inform the allocation of scarce public resources across sectors too. This paper has shown how econometric analysis can be used to provide estimates of the outcome-based marginal productivity of the NHS, with results expressed as either cost per QALY or QALY per cost. The results themselves show that despite the inflation of prices that are faced by NHS providers, cost per QALY has remained relatively stable over time, with point estimates of the amount of resources, in nominal terms, to produce an additional unit of health benefit ranging from £5,000 to £15,000 per QALY over the period between 2003/04 and 2012/13.

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Appendix

This Appendix is divided into several sections. Reading through the main paper provides a guide for the reader to access the desired results in the Appendix. A1 provides additional detail on the methodology described in the main paper. A2 provides additional detail on results of specific equations that are estimated, which broadly correspond to purposes: 1. estimates to be used as inputs into the main results, which are presented in the main paper, and 2. estimates that are produced as sensitivity analyses that are described and discussed in the main paper, but are only presented in detail in the Appendix.

Contents

A1 Additional detail on methods

A1.1 Determining an appropriate econometric specification

In the main paper, the strategy for determining an appropriate econometric specification was only outlined, giving the types of tests used and an overview of the approach to analyse each wave of data separately. The process is described in greater detail in this section.

1. The preferred specification for the preceding year analysed is used to re-estimate each outcome and expenditure equation for the year under consideration (if there is no precedent specification, this is denoted with a '*' in Table A1.1). If this re-estimation produces a result which (a) passes the appropriate statistical tests and (b) generates coefficients in line with theoretical priors, use this result as our preferred result for the year under consideration. This rule is applied to cases where the preferred specification for the preceding year is either IV or OLS. If this re-estimation produces an acceptable result, this is denoted with a '--'in Table A1.1.

2. If the re-estimation produces a result which does not pass tests/have coefficients in line with priors, re-estimate the equation having adjusted the specification as suggested by the initial result. So, for example, if the initial estimation implies the presence of weak instruments and one of the instruments is insignificant in the first-stage regression, try re-estimating the equation without the insignificant instrument. And if, for example, one of the regressors in the second-stage regression is insignificant, try re-estimating without it. If this re-estimation produces an acceptable result, this is denoted with a 'A' in Table A1.1.

3. If a relatively minor adjustment to the preceding year's specification does not generate a statistically and theoretically acceptable result, re-derive the IV equation to be estimated (again, this applies to cases where the preferred specification for the preceding year is either IV or OLS). That is, use OLS with backward stepwise regression to identify relevant covariates to be included in the second-stage regression having forced in the relevant variables throughout. For the outcome equation we force in own programme expenditure, and for the expenditure equation the other programme need variable and the total budget term are forced in throughout the stepwise procedure.

Having identified relevant covariates for the second-stage regression, again use stepwise backward regression to identify relevant instruments for the first-stage conditioning on the covariates for the second-stage identified above. In other words, these second-stage covariates are forced in throughout stepwise procedure to identify relevant instruments.

Having identified covariates for the second-stage and instruments for the first-stage, re-estimate the IV specification equation using these two sets of variables. If the endogeneity test suggests that a variable (eg own programme expenditure in the outcome equation) is clearly not endogenous then re-estimate using OLS. If this re-estimation produces an acceptable result, this is denoted with a 'B' in Table A1.1.

4. If the above re-estimation approach produces a result which does not pass tests/have coefficients in line with priors, re-estimate the equation having adjusted the specification as suggested by the initial result (for example, if the result fails the misspecification test try adding the squared value of one of the regressors to the specification). If this re-estimation produces an acceptable result, this is denoted with a 'C' in Table A1.1.

5. If the above approaches fail to produce an acceptable result, consider excluding LAs with extreme values of expenditure per person. Only explore this option for programmes with small amounts of

expenditure and/or mortality. If this re-estimation approach produces an acceptable result, this is denoted with a 'D' in Table A1.1.

6. If all of the above fail then either use a value of zero if an outcome elasticity, or, if an expenditure elasticity, adopt the preceding wave's specification and use the estimate irrespective of test results and coefficients not conforming to priors. If this approach is used, it is denoted with a 'E' in Table A1.1.

Table A1.1 Types of re-estimation undertaken

PBC	PBC description	2003/04		2004/05		2005/06		2006/07		2007/08	
		Out	Exp	Out	Exp	Out	Exp	Out	Exp	Out	Exp
1	Infectious diseases	A	A	A	A	--	--	A	A	A	--
2	Cancers and tumours	--	A	--	--	A	A	A	--	--	A
3	Diseases of the blood	n/a	B	n/a	A	n/a	--	n/a	--	n/a	--
4	Endocrine, nutritional, metabolic	E	A	A	A	A	--	A	A	D	--
5	Mental health disorders	n/a	--	n/a	--	n/a	--	n/a	--	n/a	--
6	Learning disability	n/a	A	n/a	--	n/a	D	n/a	B	n/a	--
7	Neurological problems	A	--	A	--	A	--	D	A	B	A
8	Vision problems	n/a	--	n/a	--	n/a	--	n/a	--	n/a	C
9	Hearing problems	n/a	A	n/a	C	n/a	--	n/a	--	n/a	A
10	Circulatory problems	--	--	A	--	A	--	--	--	A	--
11	Respiratory problems	--	--	A	--	A	A	--	--	A	A
12	Dental problems	n/a	A	n/a	E	n/a	E	n/a	C	n/a	D
13	Gastro-intestinal problems	A	--	--	--	--	--	--	A	--	A
14	Skin problems	n/a	--	n/a	A	n/a	A	n/a	A	n/a	--
15	Musculo-skeletal problems	n/a	--	n/a	--	n/a	--	n/a	A	n/a	--
16	Trauma and injuries	E	A	E	A	E	A	E	--	*	--
17	Genito-urinary problems	B	A	--	A	--	--	D	A	C	A
18&19	Maternity and reproductive health and neonates	E	A	--	A	--	--	C	--	A	--
20	Poisoning and adverse events	n/a	--	n/a	--	n/a	--	n/a	--	n/a	A
21	Healthy individuals	n/a	A	n/a	A	n/a	B	n/a	B	n/a	C
22	Social care needs	n/a	A	n/a	--	n/a	--	n/a	--	n/a	C
23	Other (includes GMS/PMS)	n/a	A	n/a	--	n/a	--	n/a	A	n/a	--

Table A1.1 continued Types of re-estimation undertaken

PBC	PBC description	2008/09		2009/10		2010/11		2011/12		2012/13	
		Out	Exp	Out	Exp	Out	Exp	Out	Exp	Out	Exp
1	Infectious diseases	A	--	A	--	A	--	B	--	--	--
2	Cancers and tumours	--	--	--	A	--	--	A	--	--	--
3	Diseases of the blood	n/a	--	n/a	B	n/a	B	n/a	--	n/a	--
4	Endocrine, nutritional, metabolic	--	A	A	--	B	C	--	A	B	A
5	Mental health disorders	n/a	--	n/a	--	n/a	--	n/a	--	n/a	--
6	Learning disability	n/a	--	n/a	B	n/a	C	n/a	D	n/a	B
7	Neurological problems	C	--	C	--	C	A	C	A	B	--
8	Vision problems	n/a	--	n/a	A	n/a	--	n/a	--	n/a	--
9	Hearing problems	n/a	--	n/a	C	n/a	--	n/a	C	n/a	--
10	Circulatory problems	--	A	--	--	--	B	--	--	--	A
11	Respiratory problems	--	--	B	--	A	A	--	A	A	--
12	Dental problems	n/a	B	n/a	B	n/a	B	n/a	C	n/a	B
13	Gastro-intestinal problems	A	--	A	--	A	A	A	A	A	--
14	Skin problems	n/a	--	n/a	D	n/a	B	n/a	A	n/a	A
15	Musculo-skeletal problems	n/a	C	n/a	B	n/a	C	n/a	C	n/a	--
16	Trauma and injuries	E	--	E	--	*	A	E	A	E	--
17	Genito-urinary problems	C	--	B	--	B	A	A	--	C	--
18&19	Maternity and reproductive health and neonates	A	--	B	--	B	--	A	A	--	--
20	Poisoning and adverse events	n/a	--	n/a	--	n/a	A	n/a	--	n/a	--
21	Healthy individuals	n/a	--	n/a	--	n/a	A	n/a	--	n/a	A
22	Social care needs	n/a	--	n/a	B	n/a	--	n/a	--	n/a	A
23	Other (includes GMS/PMS)	n/a	--	n/a	B	n/a	--	n/a	A	n/a	--

A1.2 Sensitivity of alternative OLS results to endogeneity

In the main paper we summarise the results for 2012/13. In this section we present summary results from all waves of data as well as more detailed results for 2012/13.

The existing literature provides two estimates of the all-cause mortality elasticity estimate for the English NHS: -0.71 (Andrews et al. 2017) and -1.089 (Claxton et al. 2018). In Table A1.2, we present the implied all-cause mortality elasticity estimates for all waves of data. Two estimates are provided, first the results from the main analysis where an IV approach is used, where judged appropriate on the basis of statistical tests, and second an alternative analysis where OLS is used for all equations.

Table A1.2 Implied all-cause mortality elasticity estimates: main analysis and all OLS approaches

	Implied all-cause mortality	
	IV + OLS (main analysis)	ALL OLS
03/04	-1.246	-0.189
04/05	-1.615	-0.293
05/06	-1.372	-0.144
06/07	-1.496	-0.209
07/08	-1.269	-0.167
08/09	-0.795	-0.154
09/10	-0.941	-0.067
10/11	-1.328	-0.066
11/12	-1.386	-0.177
12/13	-1.028	-0.153

Taken together these results reinforce the interpretation of the result in the main paper for 2012/13 only, which is that using only OLS underestimates the magnitude of the implied overall elasticity in line with the theoretical arguments about why this is likely to be the case. Note that some years' estimates from the main analysis have higher magnitudes of implied all-cause mortality elasticities than the exiting literature, which is to be expected, because the cited studies from the existing literature do not analyse individual PBCs, but instead estimate a model relating all-cause mortality and all healthcare expenditure. As such we might expect that there is an underestimate in the magnitudes of these resulting estimated elasticities due to 'aggregation bias', i.e. in these studies it is harder to obtain a clear signal from the noisy data.

The results for specific equations from 2012/13 are presented in Table A1.3

Table A1.3 PBC expenditure and outcome elasticities, 2012/13: main analysis and all OLS approaches

	Expenditure		Outcome	
	IV elasticity	OLS elasticity	IV elasticity	OLS elasticity
Cancer	1.027**	0.220	-0.361***	-0.042
Circulatory	1.285***	0.869***	-1.464***	-0.380***
Respiratory	0.928***	0.602***	-1.704***	-0.121
Gastro-intestinal	0.997***	0.656***	-1.904**	-0.062
Endocrine	0.951***	0.657***	-0.499	-0.409**
Neurological	0.856***	0.474***	N/a (already OLS)	N/a (already OLS)
Vision	1.411***	0.923***	N/a	N/a
Dental	0.855***	0.737***	N/a	N/a
Skin	1.158***	0.704***	N/a	N/a
Poisoning	1.124***	0.588***	N/a	N/a

*** p<0.01, ** p<0.05, * p<0.1

In the analysis of the 2012/13 data, 10 expenditure equations and 5 outcome equations were estimated using IV regression. In all cases, not using IVs and estimating using OLS results in a reduction in the magnitude of the point estimate of the coefficient of interest. In addition, when using OLS, there is no evidence of a statistically significant effect of own-PBC healthcare spending on cancer, respiratory and gastro-intestinal mortality.

A1.3 Sensitivity of IV results to just-identified IV approach

Recent theory suggests that potential weak instrument bias can be mitigated to some extent by including only a single instrument (Angrist & Pischke 2009). To examine the impact of this approach on our results, we have re-estimated those specifications that are over-identified, replacing the multiple instruments with only the strongest one. Tables A1.6 and A1.7 report the results of this analysis for the 'big four' programmes using our preferred outcome and expenditure specifications for 2012/13 (note that variable names are described in section A2.1). These results are summarised in Tables A1.4 and A1.5.

The preferred outcome equations for cancer and gastro-intestinal problems are already just identified. Re-estimation of the preferred outcome equations for circulatory disease and respiratory problems using only a single instrument reduces the absolute size of the outcome elasticity by just under 10%.

Table A1.4

Programme budget category		2012/13 outcome elasticity from preferred specification	Single instrument?	2012/13 outcome elasticity from preferred specification with single instrument
Cancer		-0.361**	Yes	n/a
Circulatory disease		-1.464***	No	-1.332***
Respiratory problems		-1.704***	No	-1.538***
Gastro-intestinal		-1.904**	Yes	n/a

The preferred expenditure equation for gastro-intestinal problems is already just identified. Re-estimation of the preferred expenditure equation for the cancer programme increases the expenditure elasticity marginally, but re-estimation has no effect on the elasticity in both the circulatory and respiratory PBCs.

Table A1.5

Programme budget category		2012/13 expenditure elasticity from preferred specification	Single instrument?	2012/13 expenditure elasticity from preferred specification with single instrument
Cancer		1.027**	No	1.052*
Circulatory disease		1.285***	No	1.285***
Respiratory problems		0.928***	No	0.928***
Gastro-intestinal		0.997***	Yes	n/a

Table A1.6 Re-estimation of preferred multi-instrument outcome specifications using only a single instrument for the big four programmes for 2012/13

	(1)	(2)	(3)	(4)	(5)	(6)
	PBC 2	PBC 10	PBC 10	PBC 11	PBC 11	PBC 13
	cancer	circulatory	circulatory	respiratory	respiratory	gastro-intestinal
	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend
	SYLLR 2012/13/14	SYLLR 2012/13/14	SYLLR 2012/13/14	SYLLR 2012/13/14	SYLLR 2012/13/14	SYLLR 2012/13/14
	outcome model	outcome model	outcome model	outcome model	outcome model	outcome model
	instrument spend	instrument spend	instrument spend	instrument spend	instrument spend	instrument spend
	weighted	weighted	weighted	weighted	weighted	weighted
	IV second stage	IV second stage	IV second stage	IV second stage	IV second stage	IV second stage
	GMM2S	GMM2S	GMM2S	GMM2S	GMM2S	GMM2S
	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality
	actual census 12	actual census 12	actual census 12	actual census 12	actual census 12	actual census 12
	12/13 version	12/13 specification	12/13 specification	12/13 version	12/13 version	12/13 specification
VARIABLES	preferred:one instrument	preferred:two instruments	one instrument	preferred:two instruments	one instrument	preferred:one instrument
ILAg2_OHP	-0.361**					
	[0.149]					
ILAneedCARAN	1023***	2.304***	2.226***			3.878***
	[0.134]	[0.234]	[0.237]			[0.832]
ILAg10_OHP		-1.464***	-1.332***			
		[0.268]	[0.292]			
ILAg11_OHP				-1.704***	-1.538***	
				[0.459]	[0.476]	
LPERMSICK				6.265***	6.129***	
				[1.189]	[1.200]	
LPERMSICKSQ				0.742***	0.733***	
				[0.166]	[0.167]	
ILAg13_OHP						-1.904**
						[0.897]
ILAneedCARANSQ						3.735***
						[1.352]
Constant	6.744***	11.541***	10.899***	23.203***	22.107***	11.547***
	[0.691]	[1.302]	[1.419]	[3.903]	[4.001]	[4.024]
Observations	149	149	149	149	149	149
Endogeneity test statistic	8.481	30.621	26.263	20.193	21.300	8.574
Endogeneity p-value	0.004	0.000	0.000	0.000	0.000	0.003
Kleibergen-Paap LM test statistic	10.435	24.067	20.885	19.742	18.916	10.507
Kleibergen-Paap p-value	0.001	0.000	0.000	0.000	0.000	0.001
Kleibergen-Paap F statistic	11.262	19.517	40.357	16.644	33.278	10.363
Pesaran-Taylor reset statistic	0.408	0.086	1.524	0.096	0.301	0.039
Pesaran-Taylor p-value	0.523	0.769	0.217	0.757	0.583	0.843
Hansen-Sargan test statistic		0.810		2.227		
Hansen-Sargan p-value		0.368		0.136		
Robust standard errors in brackets						
***p<0.01, ** p<0.05, * p<0.1						

Table A1.7 Re-estimation of preferred multi-instrument expenditure specifications using only a single instrument for the big four programmes for 2012/13

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	PBC 2	PBC 2	PBC 10	PBC 10	PBC 11	PBC 11	PBC 13
	cancer	cancer	circulatory	circulatory	respiratory	respiratory	gastro problems
	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend
	SYLLR 2012/13/14	SYLLR 2012/13/14	SYLLR 2012/13/14	SYLLR 2012/13/14	SYLLR 2012/13/14	SYLLR 2012/13/14	SYLLR 2012/13/14
	spend model	spend model	spend model	spend model	spend model	spend model	spend model
	instrument o/need	instrument o/need	instrument o/need	instrument o/need	instrument o/need	instrument o/need	instrument o/need
	weighted	weighted	weighted	weighted	weighted	weighted	weighted
	IV second stage	IV second stage	IV second stage	IV second stage	IV second stage	IV second stage	IV second stage
	GMM 2S	GMM 2S	GMM 2S	GMM 2S	GMM 2S	GMM 2S	GMM 2S
	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality
	actual census 12	actual census 12	actual census 12	actual census 12	actual census 12	actual census 12	actual census 12
	12/13 specification	12/13 specification	12/13 specification	12/13 specification	12/13 specification	12/13 specification	12/13 specification
VARIABLES	preferred:two instruments	one instrument	preferred:two instruments	one instrument	preferred:two instruments	one instrument	preferred:one instrument
lSYLLRacExCancer	-1.565***	-1.569***					
	[0.326]	[0.331]					
lLAgall_OHP	1.027**	1.052*	1.285***	1.285***	0.928***	0.928***	0.997***
	[0.522]	[0.596]	[0.161]	[0.165]	[0.163]	[0.164]	[0.171]
lLAneedCARAN	1.472**	1.447**					
	[0.599]	[0.665]					
lPROFOCCU	-0.472***	-0.477***					
	[0.173]	[0.181]					
lSYLLRacExCirc			-0.908***	-0.929***			
			[0.159]	[0.163]			
lNQUAL174			0.382***	0.376***	0.408***	0.408***	0.357***
			[0.078]	[0.080]	[0.071]	[0.071]	[0.076]
lWHITEEG			0.191***	0.201***			
			[0.050]	[0.051]			
lSYLLRacExResp					-0.370*	-0.370*	
					[0.193]	[0.193]	
lLAneedCARANSQ					1.945***	1.946***	0.622
					[0.395]	[0.400]	[0.475]
lSYLLRacExGast							-0.570***
							[0.218]
Constant	5.169	4.998	1.110	1.231	0.296	0.295	0.942
	[3.768]	[4.240]	[0.993]	[1.014]	[0.744]	[0.746]	[0.872]
Observations	149	149	149	149	149	149	149
Endogeneity test statistic	28.098	26.230	12.964	15.021	6.507	6.481	7.495
Endogeneity p-value	0.000	0.000	0.000	0.000	0.011	0.011	0.006
Hansen-Sargan test statistic	0.008		2.162		0.000		
Hansen-Sargan p-value	0.929		0.141		0.985		
Kleibergen-Paap LM test statistic	18.904	18.899	31.331	27.198	23.711	23.540	29.937
Kleibergen-Paap p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Kleibergen-Paap F statistic	18.752	37.971	65.251	98.789	23.538	47.153	122.358
Pesaran-Taylor reset statistic	2.365	2.213	0.808	1.271	0.483	0.363	0.024
Pesaran-Taylor p-value	0.124	0.137	0.369	0.260	0.487	0.547	0.878
Robust standard errors in brackets							
*** p<0.01, ** p<0.05, * p<0.1							

A2 Results for specific equations underpinning main results

In this section we provide the regression results for the preferred outcome and expenditure equations for each wave of data, in addition to the results of all relevant specification tests.

A2.1 Description of variable names

The census based variables used in this study have the following names:

Short variable name	Long variable name
BORNEXEU	Proportion of residents born outside the European Union
WHITEEG	Proportion of population in white ethnic group
PCWALLTI	Proportion of population of working age (16-74) with a limiting long-term illness
POPPUCAR	Proportion of population providing unpaid care
NQUAL174	Proportion of population aged 16-74 with no qualifications
HHNOCAR	Proportion of households without a car
OWNOCC	Proportion of owner occupied households
LONEPENH	Proportion of lone pensioner households
LONEPARH	Proportion of one parent households
PERMSICK	Proportion of population aged 16-74 that are permanently sick
PC74LTUN	Proportion of population aged 16-74 are long-term unemployed
WORKAGRI	Proportion of 16-74 in employment that are in agriculture
PROFOCCU	Proportion of those aged 16-74 that are in professional occupations

The short variable names are augmented with both a prefix and suffix in the preferred specifications reported below. An ‘L’ in the prefix denotes that the log value of the variable has been used in the estimation, and the numeric suffix denotes the year to which the variable relates. To obtain values for non-census years we interpolated values between the 2001 and 2011 censuses. We used census values for 2011 when estimating specifications for 2012.

Other (non-census based) indicators used in this study include:

IMD2007	Index of Multiple Deprivation 2007
IMD2010	Index of Multiple Deprivation 2010
needCARAN	Need index (incorporates CARAN or other relevant needs formula)
DIAPREV	Diabetes prevalence rate
EPIPREV	Epilepsy prevalence rate
HIVNEEDPH	HIV need index
CKDPREV	Chronic kidney disease prevalence rate
MATNEEDPP	Maternity need index

As is the case for the census-based variables, the short variable names for these other indicators are augmented with both a prefix and suffix in the preferred specifications reported below. An ‘L’ in the prefix denotes that the log value of the variable has been used in the estimation, and the numeric

suffix denotes the year to which the variable relates. Thus 'lLAhivneedph' denotes the log of the value of the HIV need index at local authority level. Sometimes, specifications 'fail' the reset test and we add the square of one of the indicators. These variables are denoted either with a '2' as a suffix (for example, 'lLAhivneedph2' is the square of the HIV need index, and 'lLAneedCARAN342' is the square of the need index for 2003/4) or with `SQ' as a suffix (for example, 'LPERMSICK07SQ' is the square of the 'permanently sick' variable for 2007).

The programme specific expenditure variables have names like 'lLAg1_34' where 'l' denotes that the log value has been used, 'LA' denotes that expenditure has been mapped to a local authority geography, 'g1' denotes expenditure in PBC 1, and '34' denotes expenditure in the financial year 2003/4. The variable name 'lLAgall_34' relates to expenditure across all PBCs in 2003/4. Sometimes, we combine expenditure across two PBCs. Thus the variable name 'lLAg1819_78' relates to expenditure across PBC 18 and PBC 19 combined in 2007/8.

The mortality variables have names like 'lSYLLRallcause345' where 'l' denotes that the log value has been used, 'SYLLR' denotes that the standardised years of life lost rate has been used, 'all cause' relates to the disease coverage, and '345' denotes that the data relate to 2003, 2004, and 2005 combined. A further example is 'lSYLLRacExIandP345'; this is a proxy for 'other PBC need' in the expenditure equation for the infectious and parasitic diseases PBC and 'acExIandP' refers to all-cause mortality excluding infectious and parasitic diseases. Another example is 'lSYLLRacExDIA345'; this is a proxy for 'other PBC need' in the expenditure equation for the diabetes PBC, and 'acExDIA' refers to all-cause mortality excluding diabetes.

All regressions are weighted regressions where analytical weights are constructed using the populations of the LAs.

A2.2 Second stage of IV regressions and OLS regressions results tables

Table A2.1 Preferred outcome specifications for 2003/04

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	PBC 1	PBC 2	PBC 7	PBC 10	PBC 11	PBC 13	PBC 17
	infectious	cancer	neurological	circulatory	respiratory	gastro	genito-urinary
	2003/4 spend	2003/4 spend	2003/4 spend	2003/4 spend	2003/4 spend	2004/5 spend	2003/4 spend
	SYLLR 2003/4/5	SYLLR 2003/4/5	SYLLR 2003/4/5	SYLLR 2003/4/5	SYLLR 2003/4/5	SYLLR 2003/4/5	SYLLR 2003/4/5
	outcome model	outcome model	outcome model	outcome model	outcome model	outcome model	outcome model
	instrument spend	instrument spend	instrument spend	instrument spend	instrument spend	instrument spend	instrument spend
	weighted	weighted	weighted	weighted	weighted	weighted	weighted
	IV second stage	IV second stage	IV second stage	IV second stage	IV second stage	IV second stage	IV second stage
	GMM2S	GMM2S	GMM2S	GMM2S	GMM2S	GMM2S	GMM2S
	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality
	actual census 03	actual census 03	actual census 03	actual census 03	actual census 03	actual census 03	actual census 03
VARIABLES	04/05 revised	04/05 specification	04/05 revised	04/05 specification	04/05 specification	04/05 revised	re-derived
lLAg1_34	-0.205						
	[0.343]						
lLAhivneedph	0.067						
	[0.072]						
lLAimd_2007exexpobook	0.460***		0.483***				
	[0.138]		[0.142]				
LWHITEEG03	-0.796***						-1.822***
	[0.213]						[0.352]
LPOPPUCAR03	-1.241***						
	[0.421]						
lLAg2_34		-0.201**					
		[0.094]					
lLAneedCARAN34		0.750***		0.716**	3.748***	0.321	
		[0.072]		[0.341]	[0.550]	[0.594]	
lLAg7_34			-0.751*				
			[0.426]				
LWORKAGRI03			0.129**				
			[0.054]				
lLAneedCARAN342			2.472				
			[1.856]				
lLAg10_34				-1.202***			
				[0.182]			
LPERMSICK03				0.637***		1.108***	
				[0.113]		[0.263]	
lLAg11_34					-1.666***		
					[0.446]		
lLAg13_34						-1.493***	
						[0.425]	
lLAg17_34							-0.063

							[0.674]
LNQUAL17403							1.321***
							[0.371]
Constant	-1.843*	5.893***	3.239**	12.254***	9.747***	12.635***	1.263
	[1.082]	[0.393]	[1.296]	[1.023]	[1.777]	[2.414]	[2.895]
Observations	144	151	135	151	151	151	151
Endogeneity test statistic	0.928	4.945	2.165	32.851	28.292	11.906	0.038
Endogeneity p-value	0.336	0.026	0.141	0.000	0.000	0.001	0.846
Kleibergen-Paap LM test statistic	7.931	16.583	12.542	19.283	13.403	14.162	17.836
Kleibergen-Paap p-value	0.005	0.000	0.002	0.000	0.000	0.000	0.000
Kleibergen-Paap F statistic	9.795	10.257	10.043	55.862	28.447	24.260	24.694
Pesaran-Taylor reset statistic	0.641	0.047	0.834	0.009	1.210	0.000	0.177
Pesaran-Taylor p-value	0.423	0.828	0.361	0.924	0.271	0.995	0.674
Hansen-Sargan test statistic		0.971	0.501				
Hansen-Sargan p-value		0.324	0.479				

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.2 Preferred expenditure specifications for 2003/04

	(1) PBC 1 infectious 2003/4 spend SYLLR 2003/4/5 spend model instrument n/a weighted OLS LA-level actual mortality actual census 03	(2) PBC 2 cancer 2003/4 spend SYLLR 2003/4/5 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 03	(3) PBC 3 blood 2003/4 spend SYLLR 2003/4/5 spend model instrument n/a weighted OLS LA-level actual mortality actual census 03	(4) PBC 4 endocrine 2003/4 spend SYLLR 2003/4/5 spend model instrument n/a weighted OLS LA-level actual mortality actual census 04	(5) PBC 5 mental health 2003/4 spend SYLLR 2003/4/5/ spend model instrument n/a weighted OLS LA-level actual mortality actual census 03	(6) PBC 6 LDisability 2003/04 spend SYLLR 2003/04/05 spend model instrument n/a weighted OLS LA-level actual mortality actual census 03	(7) PBC 7 neurological 2003/04 spend SYLLR 2003/04/05 spend model instrument n/a weighted OLS LA-level actual mortality actual census 03	(8) PBC 8 vision 2003/4 spend SYLLR 2003/4/5 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 03	(9) PBC 9 hearing 2003/4 spend SYLLR 2003/4/5 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 03	(10) PBC 10 circulatory 2003/4 spend SYLLR 2003/4/5 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 03
VARIABLES	04/05 revised	04/05 specification	re-derived OLS	04/05 revised	04/05 specification	04/05 revised	04/05 specification	04/05 specification	04/05 revised	04/05 specification
lLAgall_34	1.094***	1.711***	0.652*	0.653***	1.333***	0.646*	1.408***	0.833***	0.694*	1.873***
	[0.254]	[0.294]	[0.381]	[0.113]	[0.162]	[0.331]	[0.205]	[0.276]	[0.407]	[0.288]
lLAhivneedph	0.274***									
	[0.033]									
lSYLLRacExIandP345	-0.075									
	[0.183]									
lLAhivneedph2	0.138***									
	[0.027]									
lSYLLRacExCancer345		-1.088***								
		[0.237]								
LPROFOCCU03		-0.460***								
		[0.126]								
lSYLLRallcause345			0.321		-0.155	0.204		-0.612**	0.768	
			[0.333]		[0.143]	[0.263]		[0.301]	[0.487]	
LBORNEXEU03			0.110***							
			[0.036]							
lLAneedCARAN34			0.222							
			[0.420]							
LNQUAL17403				0.274***				0.744***		0.907***
				[0.061]				[0.141]		[0.120]
LWHITEEG03				-0.162*						
				[0.090]						
lSYLLRacExDIA345				-0.234**						
				[0.112]						
lLAmhneedindexpp					0.308*					
					[0.157]					
LPOPPUCAR03					-0.597***				0.865***	
					[0.107]				[0.259]	

LHHNOCAR03						-0.426***				
						[0.142]				
lLAneedCARAN342						1.262				
						[1.176]				
lLAepiprev0304							0.319***			
							[0.114]			
lSYLLRacExEPI345							-0.492***			
							[0.139]			
LLONEPENH03									-0.646**	
									[0.271]	
LPC74LTUN03									-0.463***	
									[0.134]	
LLONEPARH03									-0.428	
									[0.269]	
lLAimd_2007exexpobook									0.423**	
									[0.187]	
lSYLLRacExCirc345										-1.759***
										[0.335]
Constant	-4.412***	-2.084	-3.602	0.584	-4.828***	-2.782	-1.831	2.111*	-11.683***	3.212**
	[1.181]	[1.347]	[2.926]	[0.797]	[1.559]	[2.716]	[1.298]	[1.225]	[3.401]	[1.305]
Observations	147	151	150	149	151	137	151	151	151	151
R-squared	0.623		0.244	0.366	0.665	0.098	0.330			
Ramsey reset F statistic	1.280		1.021	2.043	1.403	0.678	0.144			
Probability > F	0.284		0.386	0.111	0.244	0.567	0.934			
Endogeneity test statistic		9.775						3.979	0.261	21.240
Endogeneity p-value		0.002						0.046	0.609	0.000
Kleibergen-Paap LM test statistic		26.685						31.247	20.340	23.015
Kleibergen-Paap p-value		0.000						0.000	0.000	0.000
Kleibergen-Paap F statistic		45.579						35.891	28.335	19.117
Pesaran-Taylor reset statistic		0.185						0.437	0.580	1.931
Pesaran-Taylor p-value		0.667						0.509	0.446	0.165
Hansen-Sargan test statistic								0.101	0.129	0.288
Hansen-Sargan p-value								0.751	0.720	0.592

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.2 continued Preferred expenditure specifications for 2003/04

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	PBC 11 respiratory 2003/4 spend SYLLR 2003/4/5	PBC 12 dental 2003/4 spend SYLLR 2003/4/5	PBC 13 gastro 2004/5 spend SYLLR 2004/5/6	PBC 14 skin problems 2003/04 spend SYLLR 2003/4/5	PBC 15 musculo-skeletal 2003/04 spend SYLLR 2003/4/5	PBC 16 trauma 2003/4 spend SYLLR 2003/4/5	PBC 17 genito- 2003/4 spend SYLLR 2003/4/5	PBC 1819 mat/neonates 2003/04 spend infant mort rate 2003/04/05	PBC 20 poisoning 2003/4 spend SYLLR 2003/4/5
	spend model instrument o/need weighted IV second stage GMM2S	spend model instrument n/a weighted OLS	spend model instrument o/need weighted IV second stage GMM2S	spend model instrument n/a weighted OLS	spend model instrument n/a weighted OLS	spend model instrument n/a weighted OLS	spend model instrument n/a weighted OLS	spend model o/need exogenous weighted OLS	spend model instrument o/need weighted IV second stage GMM2S
	LA-level actual mortality actual census 03	LA-level actual mortality actual census 03	LA-level actual mortality actual census 03	LA-level actual mortality actual census 04	LA-level actual mortality actual census 03	LA-level actual mortality actual census 03	LA-level actual mortality actual census 03	LA-level actual mortality actual census 03	LA-level actual mortality actual census 03
VARIABLES	04/05 specification	04/05 1/99 specification	04/05 specification	04/05 revised	04/05 specification	04/05 revised	04/05 revised	04/05 revised	04/05 specification
lSYLLRallcause345		0.736		0.131	-0.327**	0.091		0.136	-1.909***
		[0.448]		[0.113]	[0.164]	[0.122]		[0.230]	[0.412]
lLAgall_34	1.661***	0.717*	1.409***	0.700***	1.014***	0.556***	0.934***	0.757***	2.327***
	[0.217]	[0.390]	[0.219]	[0.128]	[0.176]	[0.155]	[0.193]	[0.237]	[0.413]
LPOPPUCAR03		0.823*							
		[0.454]							
LNQUAL17403	0.605***	-0.878***	0.706***	0.178**					0.860***
	[0.103]	[0.293]	[0.100]	[0.072]					[0.168]
LWORKAGRI03		0.092**							
		[0.045]							
lSYLLRacExResp345	-0.857***								
	[0.274]								
lSYLLRacExGast345			-1.132***						
			[0.239]						
LPC74LTUN03					-0.165**				
					[0.072]				
LPROFOCCU03					-0.365***				
					[0.082]				
LLONEPENH03						0.551***			
						[0.117]			
lSYLLRacExrenal345							-0.097		
							[0.165]		
LOWNOCC03							-0.403***		
							[0.124]		
lLAmatneedindexpp								0.468***	
								[0.145]	
Constant	-1.549	-6.011**	2.171*	-2.418***	-2.161	0.783	-2.077**	-1.977	-1.079
	[1.126]	[2.659]	[1.212]	[0.859]	[1.684]	[0.900]	[0.921]	[1.790]	[1.587]

Observations	151	147	151	151	151	151	151	151	151
R-squared		0.133		0.391	0.265	0.346	0.498	0.326	
Endogeneity test statistic	10.155		9.194						9.308
Endogeneity p-value	0.001		0.002						0.002
Kleibergen-Paap LM test statistic	26.355		25.192						30.213
Kleibergen-Paap p-value	0.000		0.000						0.000
Kleibergen-Paap F statistic	48.934		96.403						35.169
Pesaran-Taylor reset statistic	0.177		0.021						0.010
Pesaran-Taylor p-value	0.674		0.886						0.919
Ramsey reset F statistic		1.802		1.640	0.560	1.379	1.993	0.301	
Probability > F		0.150		0.183	0.642	0.251	0.118	0.824	
Hansen-Sargan test statistic									0.584
Hansen-Sargan p-value									0.445

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table A2.2 continued Preferred expenditure specifications for 2003/04

	(1)	(2)	(3)
	PBC 21	PBC 22	PBC 23
	HI	social care	GMS
	2003/4 spend	2003/04 spend	2003/4 spend
	SYLLR 2003/04/05	SYLLR 2003/04/05	SYLLR 2003/4/5
	spend model	spend model	spend model
	instrument o/need	o/need exogenous	instrument n/a
	weighted	weighted	weighted
	IV second stage	OLS	OLS
	GMM2S		
	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality
	actual census 03	actual census 03	actual census 03
VARIABLES	04/05 IV revised	04/05 revised	04/05 revised
lSYLLRallcause345	-2.190**	-1.539***	-0.117
	[0.983]	[0.381]	[0.116]
lLAgall_34	1.538**	1.581***	0.681***
	[0.606]	[0.513]	[0.144]
LLONEPARH03	1.088**		
	[0.505]		
LWHITEEG03			-0.423***
			[0.083]
Constant	8.683	1.534	0.831
	[5.661]	[2.555]	[0.876]
Observations	151	148	151
R-squared		0.093	0.297
Endogeneity test statistic	7.348		
Endogeneity p-value	0.007		
Hansen-Sargan test statistic	3.994		
Hansen-Sargan p-value	0.136		
Kleibergen-Paap LM test statistic	32.122		
Kleibergen-Paap p-value	0.000		
Kleibergen-Paap F statistic	19.387		
Pesaran-Taylor reset statistic	0.000		
Pesaran-Taylor p-value	0.985		
Ramsey reset F statistic		2.020	0.584
Probability > F		0.114	0.627

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.3 Preferred outcome specifications for 2004/05

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	PBC 1 infectious 2004/5 spend	PBC 2 cancer 2004/5 spend	PBC 4 endocrine 2004/5 spend	PBC 7 neurological 2004/5 spend	PBC 10 circulatory 2004/5 spend	PBC 11 respiratory 2004/5 spend	PBC 13 gastro 2004/5 spend	PBC 17 genito- 2004/5 spend	PBC 1819 mat/neonates 2004/05 spend
	SYLLR 2004/5/6 outcome model	SYLLR 2004/5/6 outcome model	SYLLR 2004/5/6 outcome model	SYLLR 2004/5/6 outcome model	SYLLR 2004/5/6 outcome model	SYLLR 2004/5/6 outcome model	SYLLR 2004/5/6 outcome model	SYLLR 2004/5/6 outcome model	inf mort rate 2004/05/06 outcome model
	instrument n/a	instrument spend	instrument spend	instrument spend	instrument spend	instrument spend	instrument spend	instrument n/a	spend exogenous
	weighted OLS	weighted IV second stage GMM2S	weighted IV second stage GMM2S	weighted IV second stage GMM2S	weighted IV second stage GMM2S	weighted IV second stage GMM2S	weighted IV second stage GMM2S	weighted OLS	weighted OLS
	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality
	actual census 04	actual census 04	actual census 04	actual census 04	actual census 04	actual census 04	actual census 04	actual census 04	actual census 04
VARIABLES	05/06 revised	05/06 specification	05/06 revised	05/06 revised	05/06 revised	05/06 revised	05/06 specification	05/06 revised	05/06 specification
lLAhivneedph	0.112**								
	[0.054]								
lLAimd_2007exexpobook	0.282***		0.667***	0.503***					0.235***
	[0.088]		[0.185]	[0.121]					[0.072]
LOWNOCC04	-0.414*								
	[0.242]								
LWHITEEG04	-0.941***							-1.964***	
	[0.195]							[0.340]	
lLAg1_45	-0.100								
	[0.107]								
lLAg2_45		-0.224**							
		[0.111]							
lLAneedCARAN45		0.778***			1.223***	4.895***	3.466***		
		[0.082]			[0.352]	[1.041]	[0.452]		
lLAg4_45			-1.843						
			[1.126]						
lLAdiaprev0405			0.855***						
			[0.297]						
lLAneedCARAN452			2.426						
			[1.905]						
lLAg7_45				-0.968**					
				[0.484]					
LWORKAGRI04				0.126**					
				[0.057]					
lLAg10_45					-1.375***				
					[0.205]				
LPERMSICK04					0.518***				

					[0.104]				
lLAg11_45						-2.494***			
						[0.832]			
lLAg13_45							-1.253***		
							[0.437]		
lLAg17_45								-0.931*	
								[0.550]	
LNQUAL17404								2.156***	0.638***
								[0.477]	[0.166]
lLAg1819_45									-0.121
									[0.101]
LLONEPENH04									-0.409**
									[0.206]
LBORNEXEU04									0.070*
									[0.040]
Constant	1.106***	6.008***	8.364**	4.082**	12.804***	13.346***	8.469***	5.829**	1.210*
	[0.344]	[0.481]	[3.974]	[1.722]	[1.042]	[3.439]	[1.872]	[2.597]	[0.631]
Observations	145	151	136	137	151	151	151	137	151
R-squared	0.565							0.211	0.457
Ramsey reset F statistic	0.698							0.803	1.023
Probability > F	0.555							0.494	0.384
Endogeneity test statistic		2.886	3.349	2.863	30.641	26.954	6.925		
Endogeneity p-value		0.089	0.067	0.091	0.000	0.000	0.009		
Hansen-Sargan test statistic		0.297		0.880					
Hansen-Sargan p-value		0.586		0.348					
Kleibergen-Paap LM test statistic		14.712	7.045	16.830	21.333	7.554	16.801		
Kleibergen-Paap p-value		0.001	0.008	0.000	0.000	0.006	0.000		
Kleibergen-Paap F statistic		9.441	10.808	14.107	67.065	13.553	33.424		
Pesaran-Taylor reset statistic		2.454	2.713	2.393	0.150	0.551	0.534		
Pesaran-Taylor p-value		0.293	0.100	0.122	0.699	0.458	0.465		

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.4 Preferred expenditure specifications for 2004/05

	(1) PBC 1 infectious 2004/5 spend SYLLR 2004/5/6 spend model instrument n/a weighted OLS LA-level actual mortality actual census 04	(2) PBC 2 cancer 2004/5 spend SYLLR 2004/5/6 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 04	(3) PBC 3 blood 2004/5 spend SYLLR 2004/5/6 spend model instrument n/a weighted OLS LA-level actual mortality actual census 04	(4) PBC 4 endocrine 2004/5 spend SYLLR 2004/5/6 spend model instrument n/a weighted OLS LA-level actual mortality actual census 04	(5) PBC 5 mental health 2004/5 spend SYLLR 2004/5/6 spend model instrument n/a weighted OLS LA-level actual mortality actual census 04	(6) PBC 6 LDisability 2004/05 spend SYLLR 2004/05/06 spend model instrument n/a weighted OLS LA-level actual mortality actual census 04	(7) PBC 7 neurological 2004/05 spend SYLLR 2004/05/06 spend model instrument n/a weighted OLS LA-level actual mortality actual census 04	(8) PBC 8 vision 2004/5 spend SYLLR 2004/5/6 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 04	(9) PBC 9 hearing 2004/5 spend SYLLR 2004/5/6 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 04	(10) PBC 10 circulatory 2004/5 spend SYLLR 2004/5/6 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 04
VARIABLES	05/06 revised	05/06 specification	05/06 revised	05/06 revised	05/06 specification	5/6 specification	5/6 specification	05/06 specification	re-derived+	05/06 specification
lLAgall_45	0.932***	1.259***	0.952***	0.573***	0.999***	0.446*	0.929***	1.350***	0.526	1.652***
	[0.210]	[0.278]	[0.355]	[0.111]	[0.170]	[0.260]	[0.212]	[0.319]	[0.412]	[0.247]
lLAhivneedph	0.252***									
	[0.028]									
lSYLLRacExIandP456	-0.125									
	[0.158]									
lLAhivneedph2	0.092***									
	[0.024]									
lSYLLRacExCancer456		-1.622***								
		[0.495]								
LPROFOCCU04		-0.907***								
		[0.275]								
LOWNOCC04		-0.578**	-0.679***							
		[0.281]	[0.180]							
lSYLLRallcause456			-0.027		-0.108	-0.154		-0.825***	0.870	
			[0.203]		[0.154]	[0.211]		[0.293]	[0.540]	
LNQUAL17404				0.172**				0.635***		0.667***
				[0.068]				[0.117]		[0.099]
LWHITEEG04				-0.215***						
				[0.082]						
lSYLLRacExDIA456				-0.103						
				[0.106]						
lLAmhneedindexpp					0.356*					
					[0.182]					
LPOPPUCAR04					-0.743***				1.026***	
					[0.099]				[0.325]	
lLAneedCARAN452						3.141**				
						[1.563]				

lLAepiprev0405							0.196*			
							[0.106]			
lSYLLRacExEPI456							-0.306**			
							[0.136]			
LLONEPENH04									-0.458	
									[0.289]	
LPC74LTUN04									-0.239*	
									[0.142]	
LLONEPARH04									-0.006	
									[0.313]	
lSYLLRacExCirc456										-1.390***
										[0.283]
Constant	-2.947***	3.265*	-4.090**	0.224	-3.165*	1.448	-0.206	-0.380	-6.905*	2.137**
	[1.015]	[1.973]	[1.814]	[0.792]	[1.786]	[1.613]	[1.367]	[1.119]	[3.779]	[1.064]
Observations	145	151	151	151	151	137	151	151	151	151
R-squared	0.584		0.371	0.369	0.667	0.073	0.200			
Ramsey reset F statistic	0.330		0.444	1.478	1.235	0.612	1.654			
Probability > F	0.803		0.722	0.223	0.299	0.609	0.180			
Endogeneity test statistic		13.951						4.380	0.049	18.772
Endogeneity p-value		0.000						0.036	0.825	0.000
Kleibergen-Paap LM test statistic		14.760						35.712	29.992	25.947
Kleibergen-Paap p-value		0.000						0.000	0.000	0.000
Kleibergen-Paap F statistic		14.608						41.912	40.253	23.031
Pesaran-Taylor reset statistic		0.442						0.123	0.044	0.024
Pesaran-Taylor p-value		0.506						0.726	0.835	0.877
Hansen-Sargan test statistic								2.023	1.404	1.474
Hansen-Sargan p-value								0.155	0.236	0.225

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.4 continued Preferred expenditure specifications for 2004/05

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PBC 11 respiratory 2004/5 spend SYLLR 2004/5/6 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 04	PBC 13 gastro 2004/5 spend SYLLR 2004/5/6 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 04	PBC 14 skin problems 2004/05 spend SYLLR 2004/5/6 spend model instrument n/a weighted OLS LA-level actual mortality actual census 04	PBC 15 musculo-skeletal 2004/05 spend SYLLR 2004/5/6 spend model instrument n/a weighted OLS LA-level actual mortality actual census 04	PBC 16 trauma 2004/5 spend SYLLR 2004/5/6 spend model instrument n/a weighted OLS LA-level actual mortality actual census 04	PBC 17 genito- 2004/5 spend SYLLR 2004/5/6 spend model instrument n/a weighted OLS LA-level actual mortality actual census 04	PBC 1819 mat/neonates 2004/05 spend infant mort rate 2004/05/06 spend model o/need exogenous weighted OLS LA-level actual mortality actual census 04	PBC 20 poisoning 2004/5 spend SYLLR 2004/5/6 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 04
VARIABLES	05/06 specification	05/06 specification	05/06 specification	05/06 specification	05/06 revised	05/06 revised	05/06 revised	05/06 specification
lSYLLRacExResp456	-0.377*							
	[0.205]							
lLAgall_45	1.253***	0.928***	0.595***	0.567***	0.576**	0.716***	0.678***	1.674***
	[0.186]	[0.167]	[0.203]	[0.164]	[0.235]	[0.242]	[0.156]	[0.297]
LNQUAL17404	0.430***	0.467***	0.176*					0.706***
	[0.080]	[0.066]	[0.101]					[0.142]
lSYLLRacExGast456		-0.399**						
		[0.203]						
lSYLLRallcause456			0.114	-0.023	-0.244		-0.025	-1.414***
			[0.175]	[0.158]	[0.150]		[0.127]	[0.295]
LWORKAGRI04			-0.032					
			[0.020]					
LPC74LTUN04				-0.203***		1.522**		
				[0.063]		[0.699]		
LPROFOCCU04				-0.390***				
				[0.097]				
lLAneedCARAN45					0.618**			
					[0.278]			
lSYLLRacExrenal456						-0.160		
						[0.188]		
LPC74LTUN04SQ						0.154*		
						[0.078]		
lLAmatneedindexpp							0.600***	
							[0.134]	
LLONEPENH04							-0.276*	
							[0.144]	
Constant	-1.899**	0.749	-1.639	-1.025	1.679	3.734	-0.983	0.219
	[0.802]	[0.746]	[1.055]	[1.468]	[1.957]	[2.268]	[0.998]	[1.395]
Observations	151	151	151	151	151	151	151	151
Endogeneity test statistic	5.586	1.528						12.795
Endogeneity p-value	0.018	0.216						0.000
Kleibergen-Paap LM test statistic	28.181	33.441						33.481

Kleibergen-Paap p-value	0.000	0.000						0.000
Kleibergen-Paap F statistic	58.442	112.795						40.539
Pesaran-Taylor reset statistic	0.021	0.845						1.118
Pesaran-Taylor p-value	0.885	0.358						0.290
Hansen-Sargan test statistic								1.316
Hansen-Sargan p-value								0.251
R-squared			0.362	0.249	0.363	0.366	0.523	
Ramsey reset F statistic			1.547	1.891	0.676	1.843	1.850	
Probability > F			0.205	0.134	0.568	0.142	0.141	

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.4 continued Preferred expenditure specifications for 2004/05

	(1) PBC 21 HI 2004/05 spend SYLLR 2004/05/06 spend model o/need exogenous weighted OLS	(2) PBC 22 social care 2004/05 spend SYLLR 2004/05/06 spend model o/need exogenous weighted OLS	(3) PBC 23a GMS 2004/5 spend SYLLR 2004/5/6 spend model instrument n/a weighted OLS
VARIABLES	LA-level actual mortality actual census 04 05/06 revised OLS	LA-level actual mortality actual census 04 05/06 OLS	LA-level actual mortality actual census 04 05/06 specification
lLAgall_45	0.709*	1.313**	0.337***
	[0.411]	[0.511]	[0.096]
LWORKAGRI04	-0.047		0.034***
	[0.036]		[0.012]
LWHITEEG04			-0.170***
			[0.046]
lSYLLRallcause456	0.323	-0.940**	0.071
	[0.277]	[0.427]	[0.062]
Constant	-4.176**	-0.206	2.166***
	[1.881]	[3.050]	[0.487]
Observations	151	98	146
R-squared	0.174	0.076	0.259
Ramsey reset F statistic	1.780	1.085	1.314
Probability > F	0.154	0.360	0.272

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.5 Preferred outcome specifications for 2005/06

	(1) PBC 1 infectious 2005/6 spend SYLLR 2005/6/7 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 05 6/7 specification	(2) PBC 2 cancer 2005/6 spend SYLLR 2005/6/7 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 05 06/07 revised	(3) PBC 4 endocrine 2005/6 spend SYLLR 2005/6/7 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 05 06/07 specification	(4) PBC 7 neurological 2005/6 spend SYLLR 2005/6/7 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 05 6/7 revised+	(5) PBC 10 circulatory 2005/6 spend SYLLR 2005/6/7 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 05 06/07 revised+	(6) PBC 11 respiratory 2005/6 spend SYLLR 2005/6/7 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 05 06/07 revised	(7) PBC 13 gastro 2005/6 spend SYLLR 2005/6/7 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 05 06/07 specification	(8) PBC 17 genito- 2005/6 spend SYLLR 2005/6/7 outcome model instrument n/a weighted OLS LA-level actual mortality actual census 05 6/7 revised 5/95%	(9) PBC 1819 mat/neonates 2005/06 spend infant mort rate 2005/6/7 outcome model spend exogenous weighted OLS LA-level actual mortality actual census 05 rederived OLS
VARIABLES									
lLAg1_56	-0.432								
	[0.377]								
lLAhivneedph	0.478***								
	[0.142]								
lLAhivneedph2	0.085								
	[0.084]								
lLAimd_2007exexpobook	0.372***		0.629***	0.223**					0.158**
	[0.097]		[0.149]	[0.102]					[0.070]
lLAg2_56		-0.159*							
		[0.086]							
lLAneedCARAN56		0.758***			0.901**	4.676***	3.416***		
		[0.078]			[0.381]	[1.026]	[0.587]		
lLAg4_56			-1.035						
			[1.002]						
lLAdiaprev0506			1.023***						
			[0.371]						
lLAg7_56				-0.325					
				[0.434]					
LPOPPUCAR05				10.101				-2.979**	
				[8.381]				[1.486]	
LPOPPUCAR05SQ				1.971					
				[1.781]					
lLAg10_56					-1.637***				
					[0.354]				
LPERMSICK05					0.737***				
					[0.135]				
lLAg11_56						-2.217***			
						[0.827]			
lLAneedCARAN562						1.629			
						[1.293]			
lLAg13_56							-1.014*		
							[0.523]		
lLAg17_56								-0.869*	

									[0.465]
LNQUAL17405									2.533***
									[0.711]
LOWNOCC05									-0.849
									[0.576]
LWHITEEG05									-0.822
									[0.515]
lLAg1819_56									
LLONEPENH05									
LBORNEXEU05									
Constant	2.241**	5.730***	6.349	14.837	14.726***	12.403***	7.559***	-0.941	1.289**
	[0.925]	[0.381]	[4.263]	[10.345]	[1.927]	[3.496]	[2.294]	[2.829]	[0.608]
Observations	149	151	136	136	151	151	151	136	151
R-squared								0.228	0.407
Endogeneity test statistic	1.680	3.078	0.937	1.490	28.751	20.370	6.411		
Endogeneity p-value	0.195	0.079	0.333	0.222	0.000	0.000	0.011		
Kleibergen-Paap LM test statistic	12.475	18.668	8.162	20.976	14.371	7.453	16.180		
Kleibergen-Paap p-value	0.000	0.000	0.004	0.000	0.001	0.006	0.000		
Kleibergen-Paap F statistic	19.089	15.860	9.794	15.137	14.185	12.876	29.084		
Pesaran-Taylor reset statistic	0.046	0.912	0.194	0.079	0.330	0.784	0.510		
Pesaran-Taylor p-value	0.830	0.340	0.660	0.779	0.566	0.376	0.475		
Hansen-Sargan test statistic		0.052		0.028	0.292				
Hansen-Sargan p-value		0.820		0.868	0.589				
Ramsey reset F statistic								0.538	0.003
Probability > F								0.657	1.000

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.6 Preferred expenditure specifications for 2005/06

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	PBC 1 infectious 2005/6 spend SYLLR 2005/6/7	PBC 2 cancer 2005/6 spend SYLLR 2005/6/7	PBC 3 blood 2005/6 spend SYLLR 2005/6/7	PBC 4 endocrine 2005/6 spend SYLLR 2005/6/7	PBC 5 mental health 2005/6 spend SYLLR 2005/6/7	PBC 6 LDisability 2005/06 spend SYLLR 2005/06/07	PBC 7 neurological 2005/06 spend SYLLR 2005/06/07	PBC 8 vision 2005/6 spend SYLLR 2005/6/7	PBC 9 hearing 2005/6 spend SYLLR 2005/6/7	PBC 10 circulatory 2005/6 spend SYLLR 2005/6/7
	spend model instrument n/a	spend model instrument o/need	spend model instrument n/a	spend model instrument n/a	spend model instrument n/a	spend model instrument n/a	spend model instrument n/a	spend model instrument o/need	spend model instrument n/a	spend model instrument o/need
	weighted OLS	weighted IV second stage GMM2S	weighted OLS	weighted OLS	weighted OLS	weighted OLS	weighted OLS	weighted IV second stage GMM2S	weighted OLS	weighted IV second stage GMM2S
	LA-level actual mortality actual census 05 06/07	LA-level actual mortality actual census 06 06/07 revised	LA-level actual mortality actual census 05 06/07	LA-level actual mortality actual census 05 06/07	LA-level actual mortality actual census 05 06/07	LA-level actual mortality actual census 05 6/7 revised	LA-level actual mortality actual census 05 6/7 specification	LA-level actual mortality actual census 05 06/07	LA-level actual mortality actual census 05 06/07	LA-level actual mortality actual census 05 06/07
VARIABLES	specification		specification	specification	specification			specification	specification	specification
lLAgall_56	1.205***	1.592***	1.486***	0.663***	0.991***	0.449*	1.220***	1.127***	0.762**	1.477***
	[0.208]	[0.282]	[0.410]	[0.126]	[0.142]	[0.266]	[0.239]	[0.278]	[0.346]	[0.206]
lLAhivneedph	0.374***									
	[0.025]									
lSYLLRacExIandP567	-0.410***									
	[0.154]									
lLAhivneedph2	0.174***									
	[0.022]									
lSYLLRacExCancer567		-1.358***								
		[0.440]								
LPROFOCCU05		-0.701***							-0.523***	
		[0.242]							[0.181]	
LOWNOCC05		-0.262								
		[0.249]								
lSYLLRallcause567			-0.978**		-0.364***	-0.061		-0.890***	-0.189	
			[0.393]		[0.134]	[0.195]		[0.263]	[0.286]	
LLONEPARH05			0.727***							
			[0.198]							
LNQUAL17405				0.281***				0.643***		0.566***
				[0.069]				[0.104]		[0.113]
lSYLLRacExDIA567				-0.060						
				[0.109]						
lLAmhneedindexpp					0.542***					
					[0.141]					
LPOPPUCAR05					-0.801***					
					[0.100]					
lLAneedCARAN562						1.844				
						[1.223]				
lLAepiprev0506							0.330***			
							[0.089]			

lSYLLRacExEPI567							-0.446***			
							[0.161]			
lSYLLRacExCirc567										-1.190***
										[0.256]
Constant	-3.136***	-0.270	0.095	-0.417	-1.681	0.915	-0.722	1.527	-3.186*	1.952*
	[1.008]	[1.991]	[2.383]	[0.844]	[1.496]	[1.474]	[1.304]	[0.987]	[1.801]	[1.147]
Observations	149	151	151	151	151	137	151	151	151	151
R-squared	0.780		0.282	0.382	0.690	0.058	0.312		0.240	
Ramsey reset F statistic	2.114		0.768	0.813	0.895	1.344	1.913		1.140	
Probability > F	0.101		0.514	0.489	0.445	0.263	0.130		0.335	
Endogeneity test statistic		8.069						4.617		21.249
Endogeneity p-value		0.005						0.032		0.000
Kleibergen-Paap LM test statistic		14.048						38.585		25.420
Kleibergen-Paap p-value		0.000						0.000		0.000
Kleibergen-Paap F statistic		15.505						48.814		22.302
Pesaran-Taylor reset statistic		0.048						0.008		0.084
Pesaran-Taylor p-value		0.826						0.928		0.772
Hansen-Sargan test statistic								0.117		0.060
Hansen-Sargan p-value								0.733		0.806

Robust standard errors in brackets
*** p<0.01, ** p<0.05, *
p<0.1

Table A2.6 continued Preferred expenditure specifications for 2005/06

	(1) PBC 11 respiratory 2005/6 spend SYLLR 2005/6/7 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 05 06/07 revised	(2) PBC 13 gastro 2005/6 spend SYLLR 2005/6/7 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 05 06/07 specification	(3) PBC 14 skin problems 2005/06 spend SYLLR 2005/6/7 spend model instrument n/a weighted OLS LA-level actual mortality actual census 05 06/07 revised	(4) PBC 15 musculo-skeletal 2005/06 spend SYLLR 2005/6/7 spend model instrument n/a weighted OLS LA-level actual mortality actual census 05 06/07 specification	(5) PBC 16 trauma 2005/6 spend SYLLR 2005/6/7 spend model instrument n/a weighted OLS LA-level actual mortality actual census 05 06/07 revised	(6) PBC 17 genito- 2005/6 spend SYLLR 2005/6/7 spend model instrument n/a weighted OLS LA-level actual mortality actual census 05 06/07 specification	(7) PBC 1819 mat/neonates 2005/06 spend infant mort rate 2005/06/07 spend model o/need exogenous weighted OLS LA-level actual mortality actual census 05 06/07 specification	(8) PBC 20 poisoning 2005/6 spend SYLLR 2005/6/7 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 05 06/07 specification
VARIABLES								
lSYLLRacExResp567	-0.381*							
	[0.207]							
lLAgall_56	1.225***	1.076***	0.840***	0.935***	0.897***	1.079***	0.865***	1.735***
	[0.191]	[0.154]	[0.190]	[0.205]	[0.250]	[0.264]	[0.157]	[0.264]
LNQUAL17405	0.414***	0.416***	0.175**					0.449***
	[0.075]	[0.059]	[0.079]					[0.136]
lSYLLRacExGast567		-0.413**						
		[0.199]						
lSYLLRallcause567			0.033	0.038	-0.170		-0.127	-1.235***
			[0.153]	[0.156]	[0.145]		[0.132]	[0.288]
LPC74LTUN05				-0.309***		0.183**		
				[0.069]		[0.081]		
LPROFOCCU05				-0.418***				
				[0.092]				
LWORKAGRI05					0.047***			
					[0.013]			
lLAneedCARAN56					0.376			
					[0.315]			
lSYLLRacExrenal567						-0.326*		
						[0.169]		
lLAmatneedindexpp							0.734***	
							[0.119]	
Constant	-1.704**	-0.274	-2.722***	-4.523***	-0.836	-0.755	-1.145	-1.676
	[0.779]	[0.721]	[0.924]	[1.593]	[2.201]	[2.014]	[0.869]	[1.299]
Observations	151	151	151	151	151	151	151	151
Endogeneity test statistic	4.593	1.596						15.227
Endogeneity p-value	0.032	0.206						0.000
Kleibergen-Paap LM test statistic	27.275	34.219						33.883
Kleibergen-Paap p-value	0.000	0.000						0.000
Kleibergen-Paap F statistic	57.822	107.256						40.297
Pesaran-Taylor reset statistic	0.002	1.800						0.260
Pesaran-Taylor p-value	0.964	0.180						0.610

Hansen-Sargan test statistic						1.785
Hansen-Sargan p-value						0.182
R-squared	0.412	0.395	0.464	0.441	0.497	
Ramsey reset F statistic	1.493	2.060	1.611	1.397	0.840	
Probability > F	0.219	0.108	0.190	0.246	0.474	

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.6 continued Preferred expenditure specifications for 2005/06

	(1)	(2)	(3)
	PBC 21	PBC 22	PBC 23a
	HI	social care	GMS
	2005/6 spend	2005/6 spend	2005/6 spend
	SYLLR 2005/6/7	SYLLR 2005/6/7	SYLLR 2005/6/7
	spend model	spend model	spend model
	instrument o/need	instrument o/need	instrument n/a
	weighted	weighted	weighted
	IV second stage	IV second stage	OLS
	GMM2S	GMM2S	
	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality
	actual census 05	actual census 05	actual census 05
VARIABLES	re-derived	06/07 specification	06/07 specification
lSYLLRallcause567	0.413	-0.893*	-0.102*
	[0.342]	[0.532]	[0.052]
lLAgall_56	0.507	1.069*	0.532***
	[0.371]	[0.614]	[0.070]
LPOPPUCAR05	-0.864**		
	[0.381]		
LBORNEXEU05	-0.151**		
	[0.067]		
LWORKAGRI05	-0.090*		0.035***
	[0.051]		[0.010]
LWHITEEG05			-0.194***
			[0.045]
Constant	-5.832***	1.173	1.929***
	[2.224]	[2.588]	[0.347]
Observations	151	116	147
R-squared			0.391
Endogeneity test statistic	0.304	0.599	
Endogeneity p-value	0.581	0.439	
Hansen-Sargan test statistic	1.658	3.943	
Hansen-Sargan p-value	0.646	0.268	
Kleibergen-Paap LM test statistic	36.779	33.298	
Kleibergen-Paap p-value	0.000	0.000	
Kleibergen-Paap F statistic	50.792	38.220	
Pesaran-Taylor reset statistic	0.527	0.000	
Pesaran-Taylor p-value	0.468	0.984	
Ramsey reset F statistic			0.691
Probability > F			0.559

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.7 Preferred outcome specifications for 2006/07

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	PBC 1	PBC 2	PBC 4	PBC 7	PBC 10	PBC 11	PBC 13	PBC 17	PBC 1819
	infectious	cancer	endocrine	neurological	circulatory	respiratory	gastro	genito-urinary	mat/neonates
	2006/7 spend	2006/7 spend	2006/7 spend	2006/7 spend	2006/7 spend	2006/7 spend	2006/7 spend	2006/7 spend	2006/7 spend
	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8	mortality rate 2006/7/8
	outcome model	outcome model	outcome model	outcome model	outcome model	outcome model	outcome model	outcome model	outcome model
	instrument spend	instrument spend	instrument spend	instrument spend	instrument spend	instrument spend	instrument spend	instrument n/a	instrument spend
	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted
	IV second stage	IV second stage	IV second stage	IV second stage	IV second stage	IV second stage	IV second stage	OLS	IV second stage
	GMM2S	GMM2S	GMM2S	GMM2S	GMM2S	GMM2S	GMM2S		GMM2S
	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality
	actual census 06	actual census 06	actual census 06	actual census 06	actual census 06	actual census 06	actual census 06	actual census 06	actual census 06
VARIABLES	07/08 revised	07/08 revised	07/08 revised+	re-derived++	07/08 specification	07/08 specification	07/08 specification	re-derived 5%/95% OLS	re-derived+
lLAg1_67	-0.608								
	[0.402]								
lLAhivneedph	0.478***								
	[0.142]								
lLAhivneedph2	0.114								
	[0.076]								
lLAimd_2007exexpobook	0.519***		0.765***	0.307***					0.292
	[0.113]		[0.178]	[0.082]					[0.191]
lLAg2_67		-0.239***							
		[0.083]							
lLAneedCARAN67		0.914***			2.296***	2.781**	4.015***		0.917**
		[0.085]			[0.282]	[1.106]	[0.782]		[0.435]
lLAneedCARAN672		0.955***							
		[0.280]							
lLAg4_67			-1.464						
			[0.976]						
lLAdiaprev0607			1.233***						
			[0.428]						
lLAg7_67				-0.869*					
				[0.494]					
LPOPPUCAR06				1.492***				-2.849**	
				[0.371]				[1.157]	
lLAg10_67					-1.404***				
					[0.218]				
LPROFOCCU06					-0.508***				
					[0.140]				
lLAg11_67						-2.281***			
						[0.801]			
LPERMSICK06						2.745**			
						[1.385]			
LPERMSICK06SQ						0.285			
						[0.203]			
lLAg13_67							-1.255**		

							[0.632]		
lLAg17_67								-0.588	
								[0.428]	
LNQUAL17406								2.140***	
								[0.524]	
LWHITEEG06								-0.973*	
								[0.557]	
lLAg1819_67									-0.085
									[0.205]
LBORNEXEU06									0.120***
									[0.039]
LHHNOCAR06									-0.708***
									[0.140]
LPC74LTUN06									0.489***
									[0.125]
Constant	2.248**	6.052***	8.080*	7.442***	10.621***	18.286***	8.505***	-2.020	2.104
	[0.944]	[0.364]	[4.157]	[2.483]	[1.006]	[5.109]	[2.703]	[2.908]	[1.481]
Observations	148	150	136	117	150	150	149	135	149
Endogeneity test statistic	1.915	8.416	2.828	2.516	35.080	24.628	6.928		0.824
Endogeneity p-value	0.166	0.004	0.093	0.113	0.000	0.000	0.008		0.364
Kleibergen-Paap LM test statistic	9.043	19.866	7.931	16.288	35.077	6.770	10.318		14.757
Kleibergen-Paap p-value	0.003	0.000	0.005	0.001	0.000	0.009	0.001		0.001
Kleibergen-Paap F statistic	15.331	16.380	9.502	7.767	30.494	12.140	15.426		9.216
Pesaran-Taylor reset statistic	0.248	0.358	0.044	0.615	0.039	1.756	0.054		1.239
Pesaran-Taylor p-value	0.618	0.550	0.834	0.433	0.843	0.185	0.817		0.266
Hansen-Sargan test statistic		1.457		0.005	0.624				2.628
Hansen-Sargan p-value		0.227		0.998	0.430				0.105
R-squared								0.222	
Ramsey reset F statistic								0.752	
Probability > F								0.523	

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.8 Preferred expenditure specifications for 2006/07

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	PBC 1	PBC 2	PBC 3	PBC 4	PBC 5	PBC 6	PBC 7	PBC 8	PBC 9
	infectious	cancer	blood	endocrine	mental health	LDisability	neurological	vision	hearing
	2006/7 spend	2006/7 spend	2006/7 spend	2006/7 spend	2006/7 spend	2006/07 spend	2006/07 spend	2006/7 spend	2006/7 spend
	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8	SYLLR 2006/7/8
	spend model	spend model	spend model	spend model	spend model	spend model	spend model	spend model	spend model
	instrument n/a	instrument o/need	instrument n/a	instrument n/a	instrument n/a	instrument n/a	instrument n/a	instrument o/need	instrument n/a
	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted
	OLS	IV second stage GMM2S	OLS	OLS	OLS	OLS	OLS	IV second stage GMM2S	OLS
	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality
	actual census 06	actual census 06	actual census 06	actual census 06	actual census 06	actual census 06	actual census 06	actual census 06	actual census 06
VARIABLES	07/08 spec revised	07/08 specification	07/08 specification	07/08 revised	07/08 specification	re-derived OLS	7/8 revised OLS	07/08 specification	07/08 revised
lLAgall_67	1.051***	1.219***	1.037***	0.630***	1.143***	0.410	0.382*	0.931***	0.989**
	[0.258]	[0.263]	[0.330]	[0.168]	[0.204]	[0.488]	[0.220]	[0.329]	[0.458]
lLAhivneedph	0.364***								
	[0.040]								
lSYLLRacExIandP678	-0.043								
	[0.288]								
lLAhivneedph2	0.165***								
	[0.026]								
LPROFOCCU06	0.647*	-0.527***				-0.762***			-0.607**
	[0.346]	[0.102]				[0.243]			[0.254]
LNQUAL17406	0.357			0.185**				0.803***	
	[0.364]			[0.078]				[0.126]	
lSYLLRacExCancer678		-0.751***							
		[0.204]							
lSYLLRallcause678			-0.648**		-0.397***	-0.561*		-0.664**	-0.079
			[0.321]		[0.124]	[0.330]		[0.273]	[0.313]
LLONEPARH06			0.565***						
			[0.194]						
lSYLLRacExDIA678				0.051					
				[0.137]					
lLAmhneedindexpp					0.560***				
					[0.148]				
LPOPPUCAR06					-0.837***				
					[0.118]				
LBORNEXEU06						0.279***			
						[0.083]			
LWHITEEG06						0.838***			
						[0.303]			
lLAepiprev0607							0.417***		
							[0.102]		
lSYLLRacExEPI678							0.119		
							[0.159]		
Constant	-3.116	-0.773	0.769	-1.014	-2.637	4.214*	2.561*	1.677	-5.653**

	[2.237]	[1.188]	[2.461]	[1.017]	[1.850]	[2.513]	[1.334]	[1.537]	[2.581]
Observations	148	150	150	150	150	150	150	150	150
R-squared	0.698		0.162	0.371	0.739	0.111	0.283		0.253
Ramsey reset F statistic	1.801		0.305	0.553	1.380	0.238	0.219		0.601
Probability > F	0.150		0.822	0.647	0.252	0.870	0.883		0.615
Endogeneity test statistic		12.742						1.869	
Endogeneity p-value		0.000						0.172	
Hansen-Sargan test statistic		0.194						0.037	
Hansen-Sargan p-value		0.660						0.848	
Kleibergen-Paap LM test statistic		33.956						34.857	
Kleibergen-Paap p-value		0.000						0.000	
Kleibergen-Paap F statistic		46.177						74.593	
Pesaran-Taylor reset statistic		0.014						0.007	
Pesaran-Taylor p-value		0.906						0.931	

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table A2.8 continued Preferred expenditure specifications for 2006/07

	(1) PBC 10 circulatory 2006/7 spend SYLLR 2006/7/8 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 06	(2) PBC 11 respiratory 2006/7 spend SYLLR 2006/7/8 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 06	(3) PBC 12 dental 2006/7 spend SYLLR 2006/7/8 spend model instrument n/a weighted OLS LA-level actual mortality actual census 07	(4) PBC 13 gastro 2006/7 spend SYLLR 2006/7/8 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 06	(5) PBC 14 skin problems 2006/7 spend SYLLR 2006/7/8 spend model instrument n/a weighted OLS LA-level actual mortality actual census 06	(6) PBC 15 musculo-skeletal 2006/7 spend SYLLR 2006/7/8 spend model instrument n/a weighted OLS LA-level actual mortality actual census 06	(7) PBC 16 trauma 2006/7 spend SYLLR 2006/7/8 spend model instrument n/a weighted OLS LA-level actual mortality actual census 06	(8) PBC 17 genito- 2006/7 spend SYLLR 2006/7/8 spend model instrument n/a weighted OLS LA-level actual mortality actual census 06	(9) PBC 1819 mat/neonates 2006/07 spend infant mort rate 2006/07/08 spend model spend exogenous weighted OLS LA-level actual mortality actual census 06	(10) PBC 20 poisoning 2006/7 spend SYLLR 2006/7/8 spend model instrument spend weighted IV second stage GMM2S LA-level real mortality actual census 06
VARIABLES	07/08 specification	07/08 specification	re-derived OLS	07/08 revised	07/08 revised	07/08 specification	07/08 specification	07/08 revised	07/08 specification	07/08 revised
lLAgall_67	1.578***	1.287***	0.835**	1.014***	0.701***	0.628**	0.705***	0.988***	0.614**	1.107***
	[0.270]	[0.221]	[0.392]	[0.210]	[0.249]	[0.246]	[0.233]	[0.242]	[0.245]	[0.300]
lSYLLRallcause678			0.628		-0.124	0.341	0.273		0.167	-0.667***
			[0.382]		[0.155]	[0.224]	[0.210]		[0.177]	[0.237]
LPERMSICK06			-0.375							
			[0.284]							
LLONEPARH06			-2.097							
			[1.704]							
LLONEPARH06SQ			-0.480							
			[0.324]							
LWHITEEG06			0.734**							
			[0.302]							
lSYLLRacExCirc678	-1.203***									
	[0.247]									
LNQUAL17406	0.553***	0.273***		0.402***						0.133
	[0.093]	[0.093]		[0.079]						[0.122]
lSYLLRacExResp678		-0.262								
		[0.221]								
lSYLLRacExGast678				-0.363						
				[0.224]						
LPROFOCCU06					-0.287***	-0.504***				
					[0.100]	[0.182]				
LPC74LTUN06						-0.475***		0.147*		
						[0.106]		[0.076]		
LWORKAGRI06							0.080***			
							[0.026]			
lSYLLRacExrenal678								-0.229		
								[0.184]		

lLAmatneedindexpp									0.561***	
									[0.123]	
Constant	1.221	-3.159***	-9.116	-0.291	-1.325	-5.128***	-2.329**	-0.867	-1.203	-1.069
	[1.349]	[1.195]	[5.559]	[1.014]	[1.338]	[1.863]	[1.041]	[1.298]	[1.307]	[1.571]
Observations	150	150	150	150	150	150	150	150	150	150
Endogeneity test statistic	26.058	7.261		4.381						11.024
Endogeneity p-value	0.000	0.007		0.036						0.001
Hansen-Sargan test statistic	0.158	0.478								1.866
Hansen-Sargan p-value	0.691	0.489								0.172
Kleibergen-Paap LM test statistic	27.832	34.096		29.551						35.141
Kleibergen-Paap p-value	0.000	0.000		0.000						0.000
Kleibergen-Paap F statistic	33.179	56.202		85.706						59.640
Pesaran-Taylor reset statistic	0.140	0.314		0.004						0.024
Pesaran-Taylor p-value	0.708	0.575		0.949						0.876
R-squared			0.343		0.286	0.277	0.230	0.358	0.391	
Ramsey reset F statistic			2.275		1.670	0.503	0.759	1.568	1.269	
Probability > F			0.083		0.176	0.681	0.519	0.200	0.287	

Robust standard errors in brackets
*** p<0.01, ** p<0.05, *
p<0.1

Table A2.8 continued Preferred expenditure specifications for 2006/07

	(1) PBC 21 HI 2006/7 spend SYLLR 2006/7/8 spend model spend exogenous weighted OLS	(2) PBC 22 social care 2006/07 spend SYLLR 2006/7/8 spend model spend exogenous weighted OLS	(3) PBC 23a GMS 2006/7 spend SYLLR 2006/7/8 spend model instrument n/a weighted OLS
VARIABLES	LA-level actual mortality actual census 07 re-derived	LA-level actual mortality actual census 06 07/08 specification OLS	LA-level actual mortality actual census 06 07/08 specification
lLAgall_67	0.709	1.702***	0.447***
	[0.432]	[0.489]	[0.112]
lSYLLRallcause678	-0.318	-0.817*	0.056
	[0.471]	[0.429]	[0.082]
LPOPPUCAR06	-2.104***		
	[0.681]		
LBORNEXEU06	-0.190***		
	[0.072]		
LNQUAL17406	0.903**		
	[0.394]		
LWORKAGRI06			0.051***
			[0.010]
LWHITEEG06			-0.225***
			[0.049]
Constant	-4.143	-3.938*	1.621***
	[3.699]	[2.367]	[0.452]
Observations	150	103	145
R-squared	0.134	0.102	0.367
Ramsey reset F statistic	1.695	0.312	0.757
Probability > F	0.171	0.817	0.520

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.9 Preferred outcome specifications for 2007/08

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	PBC 1	PBC 2	PBC 4	PBC 7	PBC 10	PBC 11	PBC 13	PBC 16	PBC 17	PBC 1819
	infectious	cancer	endocrine	Neurological	circulatory	respiratory	gastro	trauma	genito-urinary	mat/neonates
	2007/8 spend	2007/8 spend	2007/8 spend	2007/08 spend	2007/8 spend	2008/9 spend	2007/8 spend	2007/8 spend	2007/8 spend	2007/08 spend
	SYLLR 2007/8/9	SYLLR 2007/8/9	SYLLR 2007/8/9	SYLLR 2007/08/09	SYLLR 2007/8/9	SYLLR 2008/9/10	SYLLR 2007/8/9	SMR 2007/8/9	SMR 2007/8/9	infant mort rate 2007/08/09
	outcome model	outcome model	outcome model	outcome model	outcome model	outcome model	outcome model	outcome model	outcome model	outcome model
	instrument	instrument	instrument	instrument n/a	instrument	instrument	instrument	instrument	instrument	spend exogenous
	spend	spend	spend		spend	spend	spend	spend	spend	
	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted
	IV second stage	IV second stage	IV second stage	OLS	IV second stage	IV second stage	IV second stage	IV second stage	IV second stage	OLS
	GMM2S	GMM2S	GMM2S		GMM2S	GMM2S	GMM2S	GMM2S	GMM2S	
	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality
	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07
VARIABLES	08/09 revised	08/09 specification	08/09 revised	re-derived, OLS	08/09 revised	08/09 revised	08/09 specification	re-derived	re-derived	08/09 specification+
lLAg1_78	-0.660**									
	[0.290]									
lLAhivneedph	0.515***									
	[0.119]									
lLAhivneedph2	0.157**									
	[0.065]									
lLAimd_2007exexpobook	0.529***		0.487***							
	[0.086]		[0.131]							
lLAg2_78		-0.273***								
		[0.084]								
lLAneedCARAN78		0.958***			2.168***	1.838***	3.565***	3.822***	3.887**	1.494***
		[0.092]			[0.266]	[0.699]	[0.574]	[0.984]	[1.700]	[0.292]
lLAg4_78			-1.491							
			[1.274]							
LPROFOCCU07			-0.830*	-0.701***	-0.598***					
			[0.494]	[0.175]	[0.139]					
lLAg7_78				-0.237*						
				[0.131]						
LPOPPUCAR07				0.542*						
				[0.300]						
lLAg10_78					-1.315***					
					[0.172]					
lLAg11_78						-1.564***				
						[0.448]				
LPERMSICK07						3.244***				
						[1.183]				
LPERMSICK07SQ						0.364**				
						[0.168]				
lLAg13_78							-0.837**			

							[0.425]			
lLAg16_78								-0.638		
								[0.471]		
LPC74LTUN07								-0.605**		0.528***
								[0.249]		[0.114]
lLAg17_78									-1.977	
									[1.728]	
LBORNEXEU07									0.368***	0.178***
									[0.106]	[0.045]
lLAg1819_78										-0.057
										[0.084]
LHHNOCAR07										-0.641***
										[0.125]
Constant	2.369***	6.221***	4.252	2.837***	10.071***	16.150***	6.713***	0.585	8.451	3.206***
	[0.697]	[0.380]	[3.874]	[0.998]	[0.837]	[3.573]	[1.824]	[1.158]	[7.152]	[0.601]
Observations	148	152	133	150	152	152	151	151	152	151
R-squared				0.182						0.404
Endogeneity test statistic	3.991	12.271	1.372		37.856	18.331	6.454	1.100	1.226	
Endogeneity p-value	0.046	0.000	0.241		0.000	0.000	0.011	0.294	0.268	
Hansen-Sargan test statistic	0.898	0.726			0.013			0.604	0.100	
Hansen-Sargan p-value	0.343	0.394			0.908			0.437	0.751	
Kleibergen-Paap LM test statistic	19.326	20.419	8.726		31.136	9.921	12.416	11.511	10.176	
Kleibergen-Paap p-value	0.000	0.000	0.003		0.000	0.002	0.000	0.003	0.006	
Kleibergen-Paap F statistic	9.757	19.300	9.375		43.326	20.194	18.138	8.192	6.291	
Pesaran-Taylor reset statistic	1.118	1.587	0.184		1.828	1.547	0.018	0.049	0.910	
Pesaran-Taylor p-value	0.290	0.208	0.668		0.176	0.214	0.892	0.825	0.340	
Ramsey reset F statistic				1.220						0.766
Probability > F				0.305						0.515

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.10 Preferred expenditure specifications for 2007/08

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	PBC 1 infectious 2007/8 spend	PBC 2 cancer 2007/8 spend	PBC 3 blood 2007/8 spend	PBC 4 endocrine 2007/8 spend	PBC 5 mental health 2007/8 spend	PBC 6 LDisability 2007/08 spend	PBC 7 neurological 2007/8 spend	PBC 8 vision 2007/8 spend	PBC 9 hearing 2007/8 spend	PBC 10 circulatory 2007/8 spend	PBC 11 respiratory 2008/9 spend
	SYLLR 2007/8/9	SYLLR 2007/8/9	SYLLR 2007/8/9	SYLLR 2007/8/9	SYLLR 2007/8/9	SYLLR 2007/08/09	SYLLR 2008/9/10	SYLLR 2007/8/9	SYLLR 2007/8/9	SYLLR 2007/8/9	SYLLR 2008/9/10
	spend model instrument n/a	spend model instrument o/need	spend model instrument n/a	spend model instrument n/a	spend model instrument n/a	spend model instrument n/a	spend model instrument o/need	spend model instrument o/need	spend model instrument n/a	spend model instrument o/need	spend model instrument o/need
	weighted OLS	weighted IV second stage GMM2S	weighted OLS	weighted OLS	weighted OLS	weighted OLS	weighted IV second stage GMM2S	weighted IV second stage GMM2S	weighted OLS	weighted IV second stage GMM2S	weighted IV second stage GMM2S
	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality	LA-level actual mortality
	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07	actual census 07
VARIABLES	08/09 specification	08/09 revised	08/09 specification	08/09 specification	08/09 specification	08/09 specification	08/09 revised	re-derived+	08/09 revised	08/09 specification	08/09 revised
lLAgall_78	1.387***	1.626***	1.374***	0.455***	1.103***	0.386	0.733***	1.106***	0.951*	1.614***	1.555***
	[0.252]	[0.314]	[0.386]	[0.129]	[0.123]	[0.393]	[0.243]	[0.277]	[0.572]	[0.294]	[0.245]
lLAhivneedph	0.440***										
	[0.024]										
lSYLLRacExIandP789	-0.536**										
	[0.233]										
lLAhivneedph2	0.181***										
	[0.021]										
lSYLLRacExCancer789		-1.162***									
		[0.216]									
LPROFOCCU07		-0.596***				-0.785***			-0.661***		
		[0.120]				[0.270]			[0.253]		
lSYLLRallcause789			-0.612**		-0.397***	-0.715***		-0.647***	0.029		
			[0.294]		[0.108]	[0.259]		[0.222]	[0.457]		
LLONEPARH07			0.600***								
			[0.162]								
LNQUAL17407				0.721				0.545***		0.721***	0.382***
				[0.527]				[0.097]		[0.110]	[0.091]
LNQUAL17407SQ				0.120							
				[0.183]							
lLAdiaprev0708				0.114							
				[0.116]							
lSYLLRacExDIA789				-0.060							
				[0.096]							
lLAmhneedindexpp					0.598***						
					[0.107]						
LPOPPUCAR07					-0.684***						

					[0.089]						
lLAneedCARAN782						3.601**					
						[1.615]					
lSYLLRacExEPI789							-0.354				
							[0.249]				
lLAepiprev0708							0.512***				
							[0.077]				
LPERMSICK07							0.191				
							[0.120]				
lSYLLRacExCirc789										-1.395***	
										[0.263]	
lSYLLRacExResp789											-0.621***
											[0.202]
Constant	-3.903***	-1.505	-1.767	1.812	-2.007*	4.456*	4.038*	0.021	-5.920*	2.204	-2.864**
	[1.044]	[1.535]	[2.716]	[1.118]	[1.202]	[2.439]	[2.136]	[1.235]	[3.073]	[1.357]	[1.307]
Observations	150	152	152	152	152	152	152	152	152	152	152
R-squared	0.731		0.248	0.504	0.788	0.163			0.267		
Ramsey reset F statistic	0.873		0.552	1.644	0.056	0.901			2.082		
Probability > F	0.457		0.648	0.182	0.982	0.442			0.105		
Endogeneity test statistic		18.550					4.929	6.902		24.020	15.379
Endogeneity p-value		0.000					0.026	0.009		0.000	0.000
Hansen-Sargan test statistic		2.043					1.683	0.296		1.130	0.220
Hansen-Sargan p-value		0.153					0.195	0.587		0.288	0.639
Kleibergen-Paap LM test statistic		32.362					22.137	34.077		27.389	34.114
Kleibergen-Paap p-value		0.000					0.000	0.000		0.000	0.000
Kleibergen-Paap F statistic		49.406					35.000	87.353		29.951	54.028
Pesaran-Taylor reset statistic		0.590					0.342	1.152		0.002	1.060
Pesaran-Taylor p-value		0.442					0.559	0.283		0.967	0.303

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.10 continued Preferred expenditure specifications for 2007/08

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	PBC 12 dental	PBC 13 gastro	PBC 14 skin problems	PBC 15 musculo-skeletal	PBC 16 trauma	PBC 17 genito-	PBC 1819 mat/neonates	PBC 20 poisoning	PBC 21 HI	PBC 22 social care	PBC 23a GMS
	2007/8 spend	2007/8 spend	2007/08 spend	2007/08 spend	2007/8 spend	2007/8 spend	2007/08 spend	2007/8 spend	2007/08 spend	2007/8 spend	2007/8 spend
	SYLLR 2007/8/9 spend model instrument n/a	SYLLR 2007/8/9 spend model instrument o/need	SYLLR 2007/08/09 spend model instrument n/a	SYLLR 2007/08/09 spend model instrument n/a	SYLLR 2007/8/9 spend model instrument n/a	SYLLR 2007/8/9 spend model instrument n/a	infant mort rate 2007/08/09 spend model instrument o/need	SYLLR 2007/8/9 spend model instrument o/need	SYLLR 2007/08/09 spend model instrument o/need	SYLLR 2007/8/9 spend model instrument o/need	SYLLR 2007/8/9 spend model instrument n/a
	weighted OLS	weighted IV second stage GMM2S	weighted OLS	weighted OLS	weighted OLS	weighted OLS	weighted OLS	weighted IV second stage GMM2S	weighted OLS	weighted IV second stage GMM2S	weighted OLS
	LA-level actual mortality actual census 07 rederived+	LA-level actual mortality actual census 07 08/09 revised	LA-level actual mortality actual census 07 08/09 specification	LA-level actual mortality actual census 07 08/09 specification	LA-level actual mortality actual census 07 08/09 specification	LA-level actual mortality actual census 07 08/09 revised	LA-level actual mortality actual census 07 08/09 specification	LA-level real mortality actual census 07 08/09 revised	LA-level actual mortality actual census 07 re-derived,	LA-level real mortality actual census 07 re-derived+	LA-level actual mortality actual census 07 08/09
VARIABLES	OLS						OLS		OLS+		specification
lLAgall_78	0.420***	1.490***	0.787***	0.733***	1.328***	1.015***	0.563**	1.674***	1.296**	1.669**	0.553***
	[0.150]	[0.296]	[0.203]	[0.198]	[0.293]	[0.218]	[0.242]	[0.382]	[0.544]	[0.804]	[0.110]
LLONEPARH07	0.179**										
	[0.079]										
LNQUAL17407	0.094	0.390***		0.057				0.476***	0.033		
	[0.078]	[0.098]		[0.178]				[0.142]	[0.266]		
lSYLLRallcause789	0.215		-0.062	0.278	0.041		0.230	-1.095***	-0.078	-0.423	-0.062
	[0.146]		[0.134]	[0.186]	[0.225]		[0.164]	[0.323]	[0.348]	[0.615]	[0.081]
lSYLLRacExGast789		-0.786***									
		[0.273]									
lLAimd_2007exexpobook			0.262**								
			[0.107]								
LHHNOCAR07			-0.232***								
			[0.086]								
LPC74LTUN07				-0.357***							
				[0.080]							
LPOPPUCAR07				0.695***							
				[0.252]							
LWORKAGRI07					0.125***						
					[0.018]						
lSYLLRacExrenal789						-0.087					
						[0.153]					
lLAmatneedindexpp							0.597***				
							[0.093]				
LWHITEEG07									0.697**		
									[0.296]		

LLONEPENH07									-0.789*		
									[0.468]		
Constant	0.328	-1.286	-3.063**	-2.570	-5.264***	-2.654***	-1.238	-2.162	-7.075*	-6.170**	1.347***
	[1.039]	[1.375]	[1.174]	[1.597]	[1.084]	[0.916]	[1.382]	[1.918]	[3.584]	[2.758]	[0.453]
Observations	135	152	152	152	152	152	152	152	152	110	151
R-squared	0.485		0.389	0.455	0.418	0.362	0.406		0.121		0.324
Ramsey reset F statistic	1.996		1.692	1.341	1.301	1.846	0.849		0.333		1.210
Probability > F	0.118		0.171	0.264	0.277	0.141	0.469		0.801		0.308
Endogeneity test statistic		6.175						12.926		2.286	
Endogeneity p-value		0.013						0.000		0.131	
Hansen-Sargan test statistic		2.634						1.952		0.598	
Hansen-Sargan p-value		0.105						0.162		0.897	
Kleibergen-Paap LM test statistic		34.752						34.935		25.636	
Kleibergen-Paap p-value		0.000						0.000		0.000	
Kleibergen-Paap F statistic		50.766						54.957		14.920	
Pesaran-Taylor reset statistic		0.130						0.012		0.189	
Pesaran-Taylor p-value		0.719						0.914		0.664	

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.11 Preferred outcome specifications for 2008/09

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	PBC 1 infectious 2008/9 spend SYLLR 2008/9/10 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 08	PBC 2 cancer 2009/10 spend SYLLR 2009/10/11 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census08	PBC 4 endocrine 2008/9 spend SYLLR 2008/9/10 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 08	PBC 7 neurological 2008/9 spend SYLLR 2008/9/10 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 08	PBC 10 circulatory 2008/9 spend SYLLR 2008/9/10 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 08	PBC 11 respiratory 2008/9 spend SYLLR 2008/9/10 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 08	PBC 13 gastro 2008/9 spend SYLLR 2008/9/10 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 08	PBC 17 genito-urinary 2008/9 spend SYLLR 2008/9/10 spend model instrument n/a weighted OLS LA-level actual mortality actual census 08	PBC 1819 mat/neonates 2008/09 spend infant mort rate 2008/09/10 outcome model spend exogenous weighted OLS LA-level actual mortality actual census 08
VARIABLES	09/10 revised	09/10 specification	09/10 specification	PCT specification	09/10 specification	09/10 specification	09/10 revised	PCT specification	09/10 specification+
lLAg1_89	-0.549***								
	[0.201]								
lLAhivneedph	0.472***								
	[0.086]								
lLAhivneedph2	0.168***								
	[0.046]								
lLAimd_2007exexpobook	0.563***		0.690***						
	[0.077]		[0.180]						
lLAg2_89		-0.287***							
		[0.076]							
lLAneedCARAN		0.953***		1.254	2.924***	1.913*	3.774***		1.630***
		[0.092]		[0.763]	[0.274]	[0.990]	[0.601]		[0.294]
lLAg4_89			-1.607**						
			[0.802]						
LPROFOCCU08			-0.851**						
			[0.368]						
lLAg7_89				-0.304					
				[0.641]					
lLAg10_89					-1.384***				
					[0.209]				
lLAg11_89						-1.671***			
						[0.504]			
LPERMSICK08						3.922***			
						[1.287]			
LPERMSICK08SQ						0.457**			
						[0.192]			
lLAg13_89							-1.146**		
							[0.451]		
LLONEPARH08								1.455***	

								[0.359]	
lLAg17_89								-0.024	
								[0.533]	
lLAg1819_89									-0.030
									[0.091]
LBORNEXEU08									0.228***
									[0.043]
LHHNOCAR08									-0.527***
									[0.105]
LPC74LTUN08									0.354***
									[0.114]
Constant	1.873***	6.277***	4.188*	2.757	11.178***	18.058***	8.100***	3.126	2.582***
	[0.488]	[0.349]	[2.205]	[2.697]	[1.018]	[3.907]	[1.957]	[2.877]	[0.633]
Observations	148	152	149	148	152	151	150	143	151
R-squared								0.134	0.442
Endogeneity test statistic	3.777	10.300	4.581	0.931	25.219	15.773	11.326		
Endogeneity p-value	0.052	0.001	0.032	0.334	0.000	0.000	0.001		
Hansen-Sargan test statistic	2.602	0.523		3.587	0.566	2.626			
Hansen-Sargan p-value	0.272	0.470		0.166	0.452	0.105			
Kleibergen-Paap LM test statistic	22.335	25.882	9.327	16.084	24.567	11.562	13.871		
Kleibergen-Paap p-value	0.000	0.000	0.002	0.001	0.000	0.003	0.000		
Kleibergen-Paap F statistic	10.459	32.476	10.515	10.630	43.471	14.269	28.799		
Pesaran-Taylor reset statistic	0.028	0.123	0.911	1.459	0.017	0.154	0.627		
Pesaran-Taylor p-value	0.867	0.726	0.340	0.227	0.897	0.695	0.429		
Ramsey reset F statistic								0.731	0.339
Probability > F								0.535	0.797

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.12 Preferred expenditure specifications for 2008/09

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PBC 1	PBC 2	PBC 3	PBC 4	PBC 5	PBC 6	PBC 7	PBC 8
	infectious	cancer	blood	endocrine	mental health	LDisability	neurological	vision
	2008/9 spend	2008/9 spend	2008/9 spend	2008/9 spend	2008/9 spend	2008/09 spend	2008/9 spend	2008/9 spend
	SYLLR 2008/9/10	SYLLR 2008/9/10	SYLLR 2008/9/10	SYLLR 2008/9/10	SYLLR 2008/9/10	SYLLR 2008/09/10	SYLLR 2008/9/10	SYLLR 2008/9/10
	spend model	spend model	spend model	spend model	spend model	spend model	spend model	spend model
	instrument n/a	instrument o/need	instrument n/a	instrument n/a	instrument n/a	instrument n/a	instrument o/need	instrument o/need
	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted
	OLS	IV second stage GMM2S	OLS	OLS	OLS	OLS	IV second stage GMM2S	IV second stage GMM2S
	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality
	actual census 08	actual census 08	actual census 08	actual census 08	actual census 08	actual census 08	actual census 08	actual census 08
VARIABLES	09/10 specification	09/10 specification	09/10 specification	09/10 revised OLS	09/10 specification	09/10 specification	09/10 specification	09/10 specification
lLAgall_89	1.471***	0.784**	0.995***	0.498***	0.995***	0.329	0.897***	0.701***
	[0.261]	[0.335]	[0.272]	[0.147]	[0.192]	[0.351]	[0.204]	[0.223]
lLAhivneedph	0.456***							
	[0.026]							
lSYLLRacExIandP890	-0.429**							
	[0.214]							
lLAhivneedph2	0.181***							
	[0.023]							
lSYLLRacExCancer890		-1.184***						
		[0.168]						
lLAneedCARAN		1.395***						
		[0.468]						
LPROFOCCU08		-0.348***				-0.516**		
		[0.094]				[0.253]		
lSYLLRallcause890			-0.672**		-0.303***	-0.460*		-0.544**
			[0.265]		[0.112]	[0.273]		[0.213]
LLONEPARH08			0.535***					
			[0.152]					
LNQUAL17408				1.217***				0.664***
				[0.398]				[0.079]
LNQUAL17408SQ				0.347***				
				[0.129]				
lLAdiaprevinover17				0.285**				
				[0.116]				
lSYLLRacExDIA890				0.097				
				[0.105]				
lLAmhneedindexpp					0.658***			
					[0.143]			
LPOPPUCAR08					-0.618***			
					[0.104]			
lLAneedCARAN2						3.556**		
						[1.393]		
lSYLLRacExEPI890							-0.132	

							[0.152]	
lLAepilepsyov18prevrate							0.382***	
							[0.068]	
Constant	-5.190***	5.048*	1.139	0.073	-1.644	3.663*	-1.466	2.541**
	[1.130]	[2.695]	[1.594]	[0.976]	[1.724]	[2.101]	[0.992]	[1.057]
Observations	150	152	152	150	152	152	150	152
R-squared	0.783		0.194	0.579	0.789	0.104		
Ramsey reset F statistic	1.513		1.512	1.186	0.465	1.764		
Probability > F	0.214		0.214	0.317	0.707	0.157		
Endogeneity test statistic		19.732					8.533	4.237
Endogeneity p-value		0.000					0.003	0.040
Hansen-Sargan test statistic		1.028					0.081	0.592
Hansen-Sargan p-value		0.311					0.776	0.442
Kleibergen-Paap LM test statistic		36.285					32.990	34.619
Kleibergen-Paap p-value		0.000					0.000	0.000
Kleibergen-Paap F statistic		56.425					82.270	51.873
Pesaran-Taylor reset statistic		0.002					0.809	0.143
Pesaran-Taylor p-value		0.968					0.368	0.705

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.12 continued Preferred expenditure specifications for 2008/09

	(1) PBC 9 hearing 2008/9 spend SYLLR 2008/9/10 spend model instrument n/a weighted OLS LA-level actual mortality actual census 08 09/10 specification	(2) PBC 10 circulatory 2008/9 spend SYLLR 2008/9/10 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 08 09/10 spec revised	(3) PBC 11 respiratory 2008/9 spend SYLLR 2008/9/10 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 08 09/10 specification	(4) PBC 12 dental 2008/9 spend SYLLR 2008/9/10 spend model instrument n/a weighted OLS LA-level actual mortality actual census 08 rederived OLS	(5) PBC 13 gastro 2008/9 spend SYLLR 2008/9/10 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 08 09/10 specification	(6) PBC 14 skin problems 2008/09 spend SYLLR 2008/09/11 spend model instrument n/a weighted OLS LA-level actual mortality actual census 08 09/10 specification	(7) PBC 15 musculo-skeletal 2008/09 spend SYLLR 2008/09/10 spend model instrument n/a weighted OLS LA-level actual mortality actual census 08 re-derived+ OLS	(8) PBC 16 trauma 2008/9 spend SYLLR 2008/9/10 spend model instrument n/a weighted OLS LA-level actual mortality actual census 08 09/10 specification
VARIABLES								
lLAgall_89	1.637***	1.784***	0.752**	0.428**	0.520*	0.907***	0.738***	1.344***
	[0.369]	[0.276]	[0.352]	[0.198]	[0.278]	[0.199]	[0.195]	[0.222]
LOWNOCC08	0.377			0.278**				
	[0.255]			[0.110]				
lSYLLRallcause890	0.143			0.279		0.001		-0.271
	[0.320]			[0.193]		[0.123]		[0.170]
lSYLLRacExCirc890		-1.271***						
		[0.236]						
LNQUAL17408		0.515***					0.160	
		[0.087]					[0.152]	
lSYLLRacExResp890			-1.099***					
			[0.285]					
lLAneedCARAN			1.987***		2.117***			
			[0.418]		[0.434]			
lLAneedCARAN2			1.109**					
			[0.530]					
lLAimd_2007exexpobook				0.199*		0.256**		
				[0.111]		[0.108]		
lSYLLRacExGast890					-1.309***			
					[0.323]			
LHHNOCAR08						-0.222***		
						[0.074]		
LPC74LTUN08							-0.305***	
							[0.080]	
LPOPPUCAR08							0.681***	
							[0.224]	
lSYLLRallcause890							0.271	
							[0.170]	
LWORKAGRI08								0.084***
								[0.018]
Constant	-10.672***	-0.118	5.422*	-1.183	8.403***	-4.278***	-2.206	-3.653***
	[1.776]	[1.402]	[2.892]	[1.513]	[2.751]	[1.256]	[1.617]	[0.989]

Observations	152	152	152	152	152	152	152	152
R-squared	0.256			0.501		0.495	0.541	0.348
Ramsey reset F statistic	0.130			3.756		1.203	1.296	0.793
Probability > F	0.942			0.012		0.311	0.278	0.500
Endogeneity test statistic		31.218	17.243		14.052			
Endogeneity p-value		0.000	0.000		0.000			
Hansen-Sargan test statistic		0.278	0.097		0.009			
Hansen-Sargan p-value		0.598	0.756		0.924			
Kleibergen-Paap LM test statistic		28.178	34.175		32.639			
Kleibergen-Paap p-value		0.000	0.000		0.000			
Kleibergen-Paap F statistic		29.651	34.268		22.222			
Pesaran-Taylor reset statistic		0.232	0.092		0.391			
Pesaran-Taylor p-value		0.630	0.761		0.532			

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.12 continued Preferred expenditure specifications for 2008/09

	(1)	(2)	(3)	(4)	(5)	(6)
	PBC 17 genito-	PBC 1819 maternity	PBC 20 poisoning	PBC 21 HI	PBC 22 social care	PBC 23a GMS
	2008/9 spend	2008/9 spend	2008/9 spend	2008/9 spend	2008/9 spend	2008/9 spend
	SYLLR 2008/9/10	SYLLR 2008/9/10	SYLLR 2008/9/10	SYLLR 2008/9/10	SYLLR 2008/9/10	SYLLR 2008/9/10
	spend model	spend model	spend model	spend model	spend model	spend model
	instrument n/a	instrument o/need	instrument o/need	instrument n/a	instrument n/a	instrument n/a
	weighted	weighted	weighted	weighted	weighted	weighted
	OLS	IV second stage GMM2S	IV second stage GMM2S	OLS	OLS	OLS
	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	real mortality	actual mortality	actual mortality	actual mortality
	actual census 08	actual census 08	actual census 08			actual census 08
VARIABLES	09/10 specification	09/10 specification	09/10 specification	09/10 specification	09/10 specification	09/10 specification
LBORNEXEU08	0.037**					
	[0.016]					
lSYLLRacExrenal890	-0.040					
	[0.130]					
lLAneedCARAN	0.251		2.102***	1.049		
	[0.299]		[0.546]	[0.809]		
lLAgall_89	0.733***	0.963***	0.674*	0.952	1.192*	0.338***
	[0.213]	[0.339]	[0.366]	[0.699]	[0.605]	[0.089]
lSYLLRallcause890		-0.299	-1.433***	0.076	-0.463	-0.028
		[0.341]	[0.356]	[0.326]	[0.410]	[0.071]
lLAmatneedindexpp		0.809***				
		[0.135]				
Constant	-0.747	-0.903	6.637*	-3.945	-2.416	2.672***
	[1.897]	[0.819]	[3.581]	[5.837]	[3.223]	[0.350]
Observations	152	152	152	152	106	150
R-squared	0.491			0.368	0.049	0.228
Ramsey reset F statistic	1.741			0.317	0.331	0.753
Probability > F	0.161			0.813	0.803	0.522
Endogeneity test statistic		1.649	19.393			
Endogeneity p-value		0.199	0.000			
Hansen-Sargan test statistic		2.648	0.006			
Hansen-Sargan p-value		0.266	0.936			
Kleibergen-Paap LM test statistic		15.039	33.275			
Kleibergen-Paap p-value		0.002	0.000			
Kleibergen-Paap F statistic		11.224	33.862			
Pesaran-Taylor reset statistic		0.215	0.029			
Pesaran-Taylor p-value		0.643	0.865			

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.13 Preferred outcome specifications for 2009/10

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	PBC 1 infectious diseases	PBC 2 cancer	PBC 04 endocrine etc	PBC 07 neurological	PBC 10 circulatory	PBC 11 respiratory	PBC 13 gastro-intestinal	PBC 17 genito-urinary	PBC 1819 mat/neonates	PBC 16 trauma/injuries
	2009/10 spend SYLLR 2009/10/11 outcome model	2009/10 spend SYLLR 2009/10/11 outcome model	2009/10 spend SYLLR 2009/10/11 outcome model	2009/10 spend SYLLR 2009/10/11 outcome model	2008/9 spend SYLLR 2008/9/10 outcome model	2009/10 spend SYLLR 2009/10/11 outcome model	2009/10 spend SYLLR 2009/10/11 outcome model	2009/10 spend SYLLR 2009/10/11 outcome model	2009/10 spend infant mort rate 2009/10/11 outcome model	2009/10 spend SMR<75 skull fracture9/10/11 outcome model
	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	o/need exogenous weighted OLS	spend exogenous weighted OLS
	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	LA-level actual mortality	LA-level actual mortality
	actual census 09	actual census09	actual census 09	actual census 09	actual census 09	actual census 09	actual census 09	actual census 09	actual census 09	actual census 09
VARIABLES	Re-derived	08/09 version	08/09 revised v2(SI)	Re-derived(SI)+	08/09 version	Re-derived	08/09 revised(SI)	Re-derived	Re-derived, OLS	Re-derived, OLS
lLAg1_0910	-0.310*									
	[0.169]									
lLAhivneedph	0.362***									
	[0.071]									
lLAhivneedphSQ	0.123***									
	[0.037]									
lLAIMD2010	0.478***		0.658***							
	[0.079]		[0.149]							
lLAg2_0910		-0.345***								
		[0.127]								
lLACARANneed910		0.881***		1.191	3.041***	1.433**	4.291***		2.019***	1.163***
		[0.113]		[0.812]	[0.392]	[0.728]	[1.178]		[0.287]	[0.329]
lLAg4_0910			-1.075**							
			[0.462]							
LPROFOCCU09			-0.462***							
			[0.178]							
lLAg7_0910				-1.357						
				[0.845]						
lLAepiprev0910				1.413***						
				[0.384]						
LBORNEXEU09				0.187***					0.319***	
				[0.065]					[0.055]	
lLAg10_0910					-1.842***					
					[0.380]					
lLAg11_0910						-2.103***				
						[0.794]				

LPERMSICK09						4.493***				
						[1.676]				
LPERMSICK09SQ						0.508**				
						[0.239]				
lLAg13_0910							-1.989*			
							[1.111]			
lLACARANneed910SQ							3.833***			
							[1.473]			
lLAg17_0910								-2.997		
								[2.017]		
lLACKDprev18								2.662***		
								[0.791]		
LOWNOCC09								-4.052***		
								[1.354]		
LWHITEEG09								-3.945***		
								[1.170]		
LWORKAGRI09								0.522**		
								[0.205]		
lLAg1819_0910									-0.166*	
									[0.092]	
LHHNOCAR09									-0.340***	
									[0.099]	
lLAg16_0910										0.041
										[0.141]
LPC74LTUN09										-0.259**
										[0.123]
Constant	1.418***	6.559***	2.834**	14.608***	13.415***	21.341***	11.868**	20.235**	2.152***	-0.876
	[0.505]	[0.594]	[1.404]	[5.131]	[1.873]	[6.014]	[4.923]	[9.485]	[0.462]	[0.585]
Observations	147	150	148	140	150	148	148	150	149	143
R-squared									0.413	0.141
Endogeneity test statistic	1.862	5.166	6.368	3.034	34.858	13.820	8.584	2.256		
Endogeneity p-value	0.172	0.023	0.012	0.082	0.000	0.000	0.003	0.133		
Hansen-Sargan test statistic	5.056	0.020			0.877	0.766		2.729		
Hansen-Sargan p-value	0.168	0.888			0.349	0.381		0.099		
Kleibergen-Paap LM test statistic	25.041	23.944	13.637	7.203	14.621	11.432	6.617	26.731		
Kleibergen-Paap p-value	0.000	0.000	0.000	0.007	0.001	0.003	0.010	0.000		
Kleibergen-Paap F statistic	8.698	17.787	17.223	10.204	10.903	9.051	8.446	19.945		
Pesaran-Taylor reset statistic	1.073	0.329	2.068	0.575	0.000	1.083	0.251	1.449		
Pesaran-Taylor p-value	0.300	0.566	0.150	0.448	0.995	0.298	0.616	0.229		
Ramsey reset F statistic									1.439	0.050
Probability > F									0.234	0.985

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.14 Preferred expenditure specifications for 2009/10

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	PBC 1 infectious 2009/10 spend SYLLR 2009/10/11 spend model	PBC 2 cancer 2009/10 spend SYLLR 2009/10/11 spend model	PBC 3 Blood disorders 2009/10 spend SYLLR 2009/10/11 spend model	PBC 4 diabetes 2009/10 spend all causeSYLLR 2009/10/11 spend model	PBC 5 Mental health 2009/10 spend SYLLR 2009/10/11 spend model	PBC 6 LDisability 2009/10 spend SYLLR 2009/10/11 spend model	PBC 7 epilepsy 2009/10 spend all causeSYLLR 2009/10/11 spend model	PBC 8 Vision 2009/10 spend SYLLR 2009/10/11 spend model	PBC 9 hearing problems 2009/10 spend SYLLR 2009/10/11 spend model
	instrument n/a	instrument other needs	instrument n/a	instrument o/need	instrument n/a	instrument n/a	instrument o/need	instrument o/need	instrument n/a
	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted
	OLS	IV second stage GMM2S	OLS	IV second stage GMM2S	OLS	OLS	IV second stage GMM2S	OLS	OLS
	LA-level actual mortality actual census 09	LA-level actual mortality actual census09	LA-level actual mortality actual census 09	LA-level actual mortality actual census 09	LA-level actual mortality actual census 09	LA-level actual mortality actual census 09	LA-level actual mortality actual census 09	LA-level actual mortality actual census 09	LA-level actual mortality actual census 09
VARIABLES	08/09 version	revised(XR)	Re-derived, OLS	08/09 version	08/09 version	Re-derived, OLS	08/09 version	08/09 revised	Re-derived, OLS
lLAgall_0910	0.968***	0.502**	1.060***	0.708***	0.899***	0.647**	0.850***	0.934***	1.273***
	[0.288]	[0.245]	[0.277]	[0.214]	[0.225]	[0.295]	[0.225]	[0.258]	[0.359]
lLAhivneedph	0.413***								
	[0.022]								
lSYLLRacExIandP901	-0.169								
	[0.229]								
lLAhivneedphSQ	0.147***								
	[0.026]								
lSYLLRacExCancer901		-1.040***							
		[0.173]							
lLACARANneed910		1.446***		0.445					
		[0.288]		[0.335]					
LPROFOCCU09		-0.152				-0.338**			
		[0.098]				[0.139]			
lSYLLRallcause901			-0.850***		-0.107	-0.577**		-0.482*	0.310
			[0.239]		[0.138]	[0.284]		[0.275]	[0.288]
LLONEPARH09			0.703***						
			[0.132]						
lSYLLRacExDIA901				-0.167					
				[0.258]					
lLACARANneed910SQ				1.248**		3.985***			
				[0.522]		[1.155]			
lLAdiaprev0910				0.189*					
				[0.103]					
lLAmhneedindexpp					0.510***				
					[0.170]				
LPOPPUCAR09					-0.465***				
					[0.104]				

lSYLLRacExEPI901							-0.080		
							[0.212]		
lLAepiprev0910							0.394***		
							[0.074]		
LNQUAL17409								0.489***	
								[0.086]	
LOWNOCC09									0.297*
									[0.168]
Constant	-2.991**	6.566***	2.197	0.164	-1.794	2.204	0.406	0.262	-8.969***
	[1.338]	[1.661]	[1.634]	[1.976]	[2.060]	[1.477]	[0.977]	[0.967]	[1.774]
Observations	147	150	150	148	150	150	140	150	150
R-squared	0.752		0.270		0.765	0.139			0.256
Ramsey reset F statistic	0.970		0.592		0.345	1.023			0.479
Probability > F	0.409		0.621		0.793	0.385			0.698
Endogeneity test statistic		17.406		1.531			2.882	3.238	
Endogeneity p-value		0.000		0.216			0.090	0.072	
Hansen-Sargan test statistic		1.235		0.171			0.785	0.736	
Hansen-Sargan p-value		0.267		0.679			0.376	0.391	
Kleibergen-Paap LM test statistic		25.606		27.318			30.560	23.051	
Kleibergen-Paap p-value		0.000		0.000			0.000	0.000	
Kleibergen-Paap F statistic		27.743		23.097			55.103	17.739	
Pesaran-Taylor reset statistic		0.042		0.832			0.073	0.028	
Pesaran-Taylor p-value		0.838		0.362			0.787	0.866	

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.14 continued Preferred expenditure specifications for 2009/10

	(1) PBC 10 circulatory 2009/10 spend SYLLR 2009/10/11 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census09 08/09 version	(2) PBC 11 respiratory 2009/10 spend SYLLR 2009/10/11 spend model instrument other needs weighted IV second stage GMM2S LA-level actual mortality actual census09 08/09 version	(3) PBC 12 dental problems 2009/10 spend SYLLR 2009/10/11 spend model instrument n/a weighted OLS LA-level actual mortality actual census 09 Re-derived, OLS	(4) PBC 13 gastro 2009/10 spend SYLLR 2009/10/11 spend model instrument other needs weighted IV second stage GMM2S LA-level actual mortality actual census09 08/09 version	(5) PBC 14 skin problems 2009/10 spend SYLLR 2009/10/11 spend model instrument n/a weighted OLS LA-level actual mortality actual census 09 Re-derived, OLS	(6) PBC 15 musculo-skeletal 2009/10 spend SYLLR 2009/10/11 spend model instrument n/a weighted OLS LA-level actual mortality actual census 09 Re-derived, OLS	(7) PBC 16 trauma/injuries 2009/10 spend SYLLR 2009/10/11 spend model instrument n/a weighted OLS LA-level actual mortality actual census 09 08/09 version	(8) PBC 17 renal 2009/10 spend SYLLR 2009/10/11 spend model instrument n/a weighted OLS LA-level actual mortality actual census 09 08/09 version	(9) PBC 1819 maternity/neonates 2009/10 spend all causeSYLLR 2009/10/11 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 09 08/09 version
VARIABLES									
lSYLLRacExResp901		-0.565**							
		[0.273]							
lLAgall_0910	0.494*	0.576***	0.765***	0.387*	0.890***	0.295	1.090***	0.878***	0.653***
	[0.267]	[0.218]	[0.188]	[0.231]	[0.192]	[0.263]	[0.215]	[0.207]	[0.233]
lLACARANneed910	2.458***	1.252***		1.292***		0.965***		0.218	
	[0.502]	[0.309]		[0.319]		[0.340]		[0.265]	
lLACARANneed910SQ		1.323***	-1.905***						
		[0.472]	[0.538]						
lSYLLRacExCirc901	-1.965***								
	[0.460]								
lSYLLRallcause901			0.167		-0.046	0.180	-0.219		-0.405*
			[0.131]		[0.208]	[0.185]	[0.150]		[0.246]
LWORKAGRI09			-0.039**				0.069***		
			[0.018]				[0.016]		
LLONEPENH09			0.190*			0.341***			
			[0.107]			[0.119]			
lSYLLRacExGast901				-0.612***					
				[0.211]					
lLAIMD2010					0.278**				
					[0.133]				
LHHNOCAR09					-0.176**				
					[0.074]				
LPC74LTUN09						-0.317***			
						[0.077]			
LBORNEXEU09								0.051***	
								[0.017]	
lSYLLRacExrenal901								-0.171	
								[0.124]	
lLAmatneedindexpp									0.963***
									[0.088]

Constant	12.640***	3.491	-2.268**	5.218**	-3.817**	0.574	-2.171*	-0.939	2.072***
	[3.154]	[2.136]	[0.977]	[2.254]	[1.517]	[2.551]	[1.157]	[1.794]	[0.704]
Observations	150	148	150	148	148	150	150	150	150
Endogeneity test statistic	23.688	7.777		9.122					1.253
Endogeneity p-value	0.000	0.005		0.003					0.263
Hansen-Sargan test statistic	0.267	0.024		0.389					0.212
Hansen-Sargan p-value	0.606	0.877		0.533					0.899
Kleibergen-Paap LM test statistic	16.668	26.156		32.784					35.340
Kleibergen-Paap p-value	0.000	0.000		0.000					0.000
Kleibergen-Paap F statistic	11.755	22.221		29.989					69.224
Pesaran-Taylor reset statistic	0.022	0.171		2.482					0.050
Pesaran-Taylor p-value	0.883	0.679		0.115					0.822
R-squared			0.482		0.496	0.564	0.236	0.487	
Ramsey reset F statistic			1.405		1.358	1.392	0.948	1.995	
Probability > F			0.244		0.258	0.248	0.419	0.117	

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.14 continued Preferred expenditure specifications for 2009/10

	(1)	(2)	(3)	(4)
	PBC 20	PBC 21	PBC 22	PBC 23a
	poisoning	HI	social care	GMS
	2009/10 spend	2009/10 spend	2009/10 spend	2009/10 spend
	SYLLR 2009/10/11	SYLLR 2009/10/11	SYLLR 2009/10/11	SYLLR 2009/10/11
	spend model	spend model	spend model	spend model
	instrument o/need	instrument n/a	instrument n/a	instrument n/a
	weighted	weighted	weighted	weighted
	GMM2S	OLS	OLS	OLS
	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality	actual mortality
	actual census 09	actual census 09	actual census 09	actual census 09
VARIABLES	08/09 version	08/09 version	Re-derived, OLS	Re-derived, OLS
lSYLLRallcause901	-0.816***	0.232	-0.177	0.010
	[0.302]	[0.323]	[0.432]	[0.071]
lLAgall_0910	0.658**	1.246**	0.844	0.564***
	[0.304]	[0.506]	[0.563]	[0.085]
lLACARANneed910	1.110***	0.939		
	[0.390]	[0.570]		
Constant	3.017	-7.085*	-1.640	0.751**
	[2.692]	[4.068]	[2.855]	[0.369]
Observations	150	150	97	148
R-squared		0.385	0.035	0.463
Endogeneity test statistic	12.352			
Endogeneity p-value	0.000			
Hansen-Sargan test statistic	0.078			
Hansen-Sargan p-value	0.781			
Kleibergen-Paap LM test statistic	25.438			
Kleibergen-Paap p-value	0.000			
Kleibergen-Paap F statistic	21.297			
Pesaran-Taylor reset statistic	0.008			
Pesaran-Taylor p-value	0.928			
Ramsey reset F statistic		0.507	1.066	0.112
Probability > F		0.678	0.368	0.953

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.15 Preferred outcome specifications for 2010/11

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	PBC 1 infectious diseases	PBC 2 cancer	PBC 04 endocrine etc	PBC 07 neurological etc	PBC 10 circulatory	PBC 11 respiratory	PBC 13 gastro-intestinal	PBC 17 genito-urinary	PBC 1819 maternity/neonates	PBC 16 trauma/injuries
	2010/11 spend	2010/11 spend	2010/11 spend	2010/11 spend	2010/11 spend	2010/11 spend	2010/11 spend	20010/11 spend	20010/11 spend	2010/11 spend
	SYLLR 2010/11/12 outcome model	SYLLR 2010/11/12 outcome model	SYLLR 2010/11/12 outcome model	SYLLR 2010/11/12 outcome model	SYLLR 20010/11/12 outcome model	SYLLR 2010/11/12 outcome model	SYLLR 2010/11/12 outcome model	SYLLR 2010/11/12 outcome model	SYLLR 2010/11/12 outcome model	SMR<75 skull fracture outcome model
	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	instrument spend weighted IV second stage	spend exogenous weighted OLS
	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	GMM2S LA-level actual mortality	LA-level actual mortality
	actual census 10	actual census10	actual census 10	actual census 10	actual census 10	actual census 10	actual census 10	actual census 10	actual census 10	actual census 10
VARIABLES	Re-derived	09/10 version	Re-derived, OLS	Re-derived plus	09/10 version	09/10 version revised	09/10 version revised	Re-derived	Re-derived	09/10 version & Re-derived, OLS
lLAg1_1011	-0.256									
	[0.285]									
lLAhivneedph	0.305***									
	[0.107]									
lLAIMD2010	0.590***									
	[0.125]									
lLAg2_1011		-0.220***								
		[0.079]								
lLACARANneed1011		0.841***		0.994**	2.170***		3.324***		2.165***	1.003***
		[0.080]		[0.489]	[0.255]		[0.498]		[0.341]	[0.213]
lLAg4_1011			-0.174							
			[0.175]							
LPROFOCCU10			-0.982***							
			[0.136]							
LOWNOCC10			-0.731***							
			[0.125]							
lLAg7_1011				-0.374						
				[0.515]						
lLAg10_1011					-1.692***					
					[0.395]					
lLAg11_1011						-2.006**				
						[0.821]				
LPERMSICK10						7.423***				
						[2.212]				
LPERMSICK10SQ						0.905***				

						[0.300]				
lLAg13_1011							-1.425**			
							[0.631]			
lLACARANneed1011SQ							4.413***			
							[1.579]			
lLAg17_1011								-2.830		
								[2.322]		
LPOPPUCAR10								-2.567*		
								[1.414]		
LWHITEEG10								-1.802**		
								[0.750]		
LNQUAL17410								3.130***		
								[0.841]		
lLAg1819_1011									-0.040	
									[0.240]	
LHHNOCAR10									-0.454***	
									[0.132]	
LBORNEXEU10									0.326***	
									[0.059]	
lLAg16_1011										-0.064
										[0.129]
Constant	0.927	6.119***	0.468	2.968	12.742***	26.332***	9.358***	9.693	1.389	0.618
	[0.638]	[0.369]	[0.611]	[2.232]	[1.931]	[7.442]	[2.781]	[11.907]	[1.212]	[0.548]
Observations	147	150	149	150	150	150	150	152	149	134
R-squared										0.157
Endogeneity test statistic	0.845	6.251		1.359	28.477	21.491	13.803	1.615	0.121	
Endogeneity p-value	0.358	0.012		0.244	0.000	0.000	0.000	0.204	0.728	
Hansen-Sargan test statistic	0.162	0.882			1.843					
Hansen-Sargan p-value	0.688	0.348			0.175					
Kleibergen-Paap LM test statistic	13.677	27.563		11.334	16.195	8.269	6.906	10.628	18.511	
Kleibergen-Paap p-value	0.001	0.000		0.001	0.000	0.004	0.009	0.001	0.000	
Kleibergen-Paap F statistic	9.561	25.020		16.653	12.595	10.897	8.704	11.406	23.729	
Pesaran-Taylor reset statistic	2.067	0.468		0.312	0.117	0.000	0.128	1.600	0.129	
Pesaran-Taylor p-value	0.150	0.494		0.576	0.732	0.994	0.721	0.206	0.719	
Ramsey reset F statistic			0.324							0.049
Probability > F			0.808							0.985

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.16 Preferred expenditure specifications for 2010/11

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	PBC 1 infectious 2010/11 spend	PBC 2 cancer 2010/11 spend	PBC 3 Blood disorders	PBC 4 diabetes 2010/11 spend	PBC 5 Mental health	PBC 6 LDisability	PBC 7 epilepsy 2010/11 spend	PBC 8 Vision	PBC 9 hearing problems
	SYLLR 2010/11/12 spend model	SYLLR 2010/11/12 spend model	2010/11 spend SYLLR 2010/11/12 spend model	SYLLR 2010/11/12 spend model	2009/10 spend SYLLR 2009/10/11 spend model	2010/11 spend SYLLR 2010/11/12 spend model	all cause SYLLR 2010/11/12 spend model	2010/11 spend SYLLR 2010/11/12 spend model	2010/11 spend SYLLR 2010/11/12 spend model
	instrument n/a	instrument other needs	instrument n/a	instrument o/need	instrument n/a	instrument o/need	weighted	instrument o/need	instrument n/a
	weighted	weighted	weighted	weighted	weighted	weighted	IV second stage	weighted	weighted
	OLS	IV second stage GMM2S	OLS	IV second stage GMM2S	OLS	GMM2S	GMM2S	GMM2S	OLS
	LA-level actual mortality actual census 10	LA-level actual mortality actual census10	LA-level actual mortality actual census 10	LA-level actual mortality actual census 1-	LA-level actual mortality actual census 09	LA-level actual mortality actual census 10	LA-level actual mortality actual census 10	LA-level actual mortality actual census 10	LA-level actual mortality actual census 10
VARIABLES	09/10 version	09/10 version	Re-derived, OLS	Re-derived +XR	09/10 version	Re-derived plus	Re-derived	09/10 version	09/10 version
lLAgall_1011	1.006***	0.438	0.332	0.696***	0.973***	1.208**	0.557***	0.997***	0.808*
	[0.294]	[0.380]	[0.302]	[0.175]	[0.285]	[0.500]	[0.193]	[0.234]	[0.417]
lLAhivneedph	0.409***								
	[0.018]								
lSYLLRacExIandP012	0.140								
	[0.210]								
lLAhivneedphSQ	0.051**								
	[0.022]								
lSYLLRacExCancer012		-1.466***							
		[0.262]							
lLACARANneed1011		1.778***							
		[0.480]							
LPROFOCCU10		-0.441***				-1.067***			
		[0.167]				[0.326]			
lSYLLRallcause012			0.286		-0.109	-1.601**		-0.593**	0.599
			[0.216]		[0.172]	[0.693]		[0.248]	[0.375]
LBORNEXEU10			0.175***						
			[0.024]						
lSYLLRacExDIA012				-0.215					
				[0.152]					
LNQUAL17410				0.903*				0.439***	
				[0.485]				[0.078]	
LNQUAL17410SQ				0.204					
				[0.161]					
LWHITEEG10				-0.269***		1.044***			
				[0.047]		[0.294]			
lLAmhneedindexpp					0.530***				
					[0.185]				
LPOPPUCAR10					-0.435***				
					[0.151]				

LLONEPENH10						-0.911**	-0.307*		
						[0.366]	[0.184]		
LWORKAGRI10						-0.181***			
						[0.044]			
LPC74LTUN10						-0.449**	-0.272***		
						[0.185]	[0.078]		
lSYLLRacExEPI012							0.348		
							[0.296]		
lLAepiprev1011							0.537***		
							[0.189]		
LOWNOCC10									0.503***
									[0.165]
Constant	-5.084***	9.093***	-0.747	0.904	-2.280	-1.164	-1.088	0.526	-7.387***
	[1.584]	[2.751]	[1.445]	[1.034]	[2.392]	[3.074]	[1.998]	[0.928]	[2.104]
Observations	148	150	150	150	150	137	150	150	150
R-squared	0.782		0.283		0.606				0.168
Ramsey reset F statistic	1.263		0.226		0.083				0.627
Probability > F	0.290		0.878		0.969				0.599
Endogeneity test statistic		18.766		4.212		3.883	2.038	3.617	
Endogeneity p-value		0.000		0.040		0.049	0.153	0.057	
Hansen-Sargan test statistic		0.229		2.634		0.044	0.310	0.271	
Hansen-Sargan p-value		0.632		0.268		0.833	0.578	0.603	
Kleibergen-Paap LM test statistic		23.548		32.240		20.213	24.854	23.506	
Kleibergen-Paap p-value		0.000		0.000		0.000	0.000	0.000	
Kleibergen-Paap F statistic		30.069		56.655		20.440	22.773	18.701	
Pesaran-Taylor reset statistic		0.009		2.378		0.205	0.551	0.051	
Pesaran-Taylor p-value		0.923		0.123		0.651	0.458	0.821	

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.16 continued Preferred expenditure specifications for 2010/11

	(1) PBC 10 circulatory 2010/11 spend SYLLR 2010/11/12 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census10 Re-derived	(2) PBC 11 respiratory 2010/11 spend SYLLR 2010/11/12 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census10 09/10 version revised	(3) PBC 12 dental problems 2010/11 spend SYLLR 2010/11/12 spend model instrument n/a weighted OLS LA-level actual mortality actual census 10 Re-derived, OLS	(4) PBC 13 gastro problems 2010/11 spend SYLLR 2010/11/12 spend model instrument o/need weighted GMM2S LA-level actual mortality actual census 10 09/10 revised	(5) PBC 14 skin problems 2010/11 spend SYLLR 2010/11/12 spend model instrument o/need weighted GMM2S LA-level actual mortality actual census 10 Re-derived	(6) PBC 15 musculo-skeletal 2010/11 spend SYLLR 2010/11/12 spend model instrument n/a weighted OLS LA-level actual mortality actual census 10 09/10 version, OLS plus	(7) PBC 16 trauma/injuries 2010/11 spend SYLLR 2010/11/12 spend model instrument n/a weighted OLS LA-level actual mortality actual census 10 09/10 version revised	(8) PBC 17 renal 2010/11 spend SYLLR 2010/11/12 spend model instrument n/a weighted OLS LA-level actual mortality actual census 10 09/10 version revised	(9) PBC 1819 maternity/neonates 2010/11 spend all causeSYLLR 2010/11/12 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 10 09/10 version
VARIABLES									
lSYLLRacExCirc012	-0.979***								
	[0.252]								
lLAgall_1011	1.013***	1.192***	0.229	1.040***	0.422*	0.489**	0.589**	0.631***	0.342
	[0.223]	[0.268]	[0.192]	[0.315]	[0.235]	[0.226]	[0.250]	[0.135]	[0.233]
LNQUAL17410	0.458***	0.345***		0.339***		0.412***			
	[0.090]	[0.094]		[0.118]		[0.130]			
lSYLLRacExResp012		-0.547*							
		[0.320]							
lSYLLRallcause012			-0.023		-0.285	0.341	-0.032		-0.253
			[0.154]		[0.249]	[0.216]	[0.182]		[0.211]
lLACARANneed1011			0.660**						
			[0.273]						
LLONEPENH10			-0.209**						
			[0.082]						
lSYLLRacExGast012				-0.691**					
				[0.334]					
LPC74LTUN10					0.385***	-0.359***			
					[0.129]	[0.090]			
LBORNEXEU10					-0.085***				
					[0.030]				
LOWNOCC10						0.258**			
						[0.130]			
LWORKAGRI10							0.069***		
							[0.026]		
LHHNOCAR10							0.083		
							[0.103]		
LWHITEEG10								-0.099*	
								[0.058]	
lSYLLRacExrenal012								0.105	
								[0.119]	

lLAmatneedindexpp									1.049***
									[0.093]
Constant	3.705***	-0.718	2.190	1.298	3.586	-1.983	0.523	-0.928	3.394***
	[0.979]	[1.102]	[1.812]	[1.395]	[2.551]	[1.812]	[1.605]	[0.577]	[0.909]
Observations	150	150	150	150	147	150	150	150	150
Endogeneity test statistic	14.309	8.904		5.635	2.987				0.593
Endogeneity p-value	0.000	0.003		0.018	0.084				0.441
Hansen-Sargan test statistic	0.689	0.101			3.182				3.084
Hansen-Sargan p-value	0.406	0.751			0.204				0.214
Kleibergen-Paap LM test statistic	20.987	22.353		26.652	25.360				32.544
Kleibergen-Paap p-value	0.000	0.000		0.000	0.000				0.000
Kleibergen-Paap F statistic	20.267	17.314		73.904	23.609				75.024
Pesaran-Taylor reset statistic	2.257	1.617		0.342	0.087				0.876
Pesaran-Taylor p-value	0.133	0.204		0.559	0.769				0.349
R-squared			0.431			0.417	0.181	0.388	
Ramsey reset F statistic			2.118			1.833	1.758	0.307	
Probability > F			0.101			0.144	0.158	0.821	

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.16 continued Preferred expenditure specifications for 2010/11

	(1)	(2)	(3)	(4)
	PBC 20	PBC 21	PBC 22	PBC 23a
	poisoning	HI	social care	GMS
	2010/11 spend	2010/11 spend	2010/11 spend	2010/11 spend
	SYLLR 2010/11/12	SYLLR 2010/11/12	SYLLR 2010/11/12	SYLLR 2010/11/12
	spend model	spend model	spend model	spend model
	instrument o/need	instrument n/a	instrument n/a	instrument n/a
	weighted	weighted	weighted	weighted
	GMM2S	OLS	OLS	OLS
	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality	actual mortality
	actual census 10	actual census 10	actual census 10	actual census 10
VARIABLES	09/10 version revised	09/10 version revised	09/10 version	09/10 version
lSYLLRallcause012	-1.109**	0.258	-0.260	0.050
	[0.500]	[0.461]	[0.539]	[0.104]
lLAgall_1011	1.078**	1.359**	1.592**	0.520***
	[0.457]	[0.594]	[0.673]	[0.120]
LNQUAL17410	0.420***	0.413		
	[0.156]	[0.336]		
Constant	2.149	-7.612*	-6.686**	0.790
	[1.650]	[4.097]	[2.913]	[0.585]
Observations	150	149	93	150
R-squared		0.200	0.119	0.365
Endogeneity test statistic	6.385			
Endogeneity p-value	0.012			
Hansen-Sargan test statistic	1.613			
Hansen-Sargan p-value	0.204			
Kleibergen-Paap LM test statistic	23.506			
Kleibergen-Paap p-value	0.000			
Kleibergen-Paap F statistic	18.701			
Pesaran-Taylor reset statistic	0.128			
Pesaran-Taylor p-value	0.720			
Ramsey reset F statistic		1.080	0.437	1.133
Probability > F		0.360	0.727	0.338

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.17 Preferred outcome specifications for 2011/12

	(1) PBC 1 infectious	(2) PBC 2 cancer	(3) PBC 04 endocrine etc	(4) PBC 07 neurological etc	(5) PBC 10 circulatory	(6) PBC 11 respiratory	(7) PBC 13 gastro-intestinal	(8) PBC 17 renal	(9) PBC 1819 mat/neonates	(10) PBC 16 trauma/injuries
	2011/12 spend SYLLR 2011/12/13 spend model	2011/12 spend SYLLR 2011/12/13 outcome model	2011/12 spend SYLLR 2011/12/13 outcome model	2011/12 spend SYLLR 2011/12/13 outcome model	2011/12 spend SYLLR 2011/12/13 outcome model	2011/12 spend SYLLR 2011/12/13 outcome model	2011/12 spend SYLLR 2011/12/13 outcome model	2011/12 spend SYLLR 2011/12/13 outcome model	2011/12 spend infant m/rate 2011/12/13 outcome model	2011/12 spend SMR<75 skull fracture outcome model
	instrument n/a	instrument spend	instrument n/a	instrument spend	instrument spend	instrument spend	instrument spend	instrument n/a	spend exogenous	spend exogenous
	weighted OLS	weighted IV second stage GMM2S	weighted OLS	weighted IV second stage GMM2S	weighted IV second stage GMM2S	weighted IV second stage GMM2S	weighted IV second stage GMM2S	weighted OLS	weighted OLS	weighted OLS
	LA-level actual mortality actual census 11	LA-level actual mortality actual census11	LA-level actual mortality actual census 11	LA-level actual mortality actual census 11	LA-level actual mortality actual census 11	LA-level actual mortality actual census 11	LA-level actual mortality actual census 11	LA-level actual mortality actual census 11	LA-level actual mortality actual census 11	LA-level actual mortality actual census 11
VARIABLES	Re-derived, OLS	10/11 version SI	10/11 version	Re-derived+	10/11 version	10/11 version	10/11 version DI	Re-derived, OLS	10/11 version	10/11 version & Re-derived, OLS
lLAg1_1112	-0.305***									
	[0.094]									
lLAhivneedph	0.172***									
	[0.049]									
lLAIMD2010	0.637***			0.402**						
	[0.062]			[0.175]						
LLONEPENH11	-0.666***									
	[0.182]									
lLAg2_1112		-0.430***								
		[0.157]								
lLACARANneed1112		1.055***			2.452***		4.078***		1.989***	1.266***
		[0.135]			[0.295]		[0.949]		[0.377]	[0.265]
lLAg4_1112			-0.199							
			[0.196]							
LPROFOCCU11			-1.041***							
			[0.147]							
LOWNOCC11			-0.555***							
			[0.139]							
lLAg7_1112				-1.415						
				[1.125]						
LWORKAGRI11				0.039						
				[0.051]						
lLAepiprev1112				1.271						
				[0.779]						
lLAg10_1112					-1.611***					
					[0.343]					

lLAg11_1112						-1.743***				
						[0.598]				
LPERMSICK11						6.198***				
						[1.592]				
LPERMSICK11SQ						0.727***				
						[0.220]				
lLAg13_1112							-2.000**			
							[0.984]			
lLACARANneed1112SQ							4.644***			
							[1.513]			
LWHITEEG11								-2.062***		
								[0.484]		
LNQUAL17411								1.246***		
								[0.461]		
lLAg17_1112								-0.494		
								[0.827]		
lLAg1819_1112									-0.136	
									[0.110]	
LBORNEXEU11									0.298***	
									[0.065]	
LHHNOCAR11									-0.357***	
									[0.106]	
lLAg16_1112										0.143
										[0.180]
Constant	-0.523	7.072***	0.581	12.713	12.292***	23.178***	11.964***	2.395	1.830***	-0.140
	[0.454]	[0.727]	[0.735]	[8.281]	[1.675]	[5.233]	[4.389]	[3.962]	[0.579]	[0.773]
Observations	145	148	147	148	148	148	148	148	147	149
R-squared	0.629		0.329					0.113	0.245	0.196
Ramsey reset F statistic	0.313		0.806					0.273	0.835	0.443
Probability > F	0.816		0.492					0.845	0.477	0.723
Endogeneity test statistic		9.404		2.857	25.774	14.703	10.016			
Endogeneity p-value		0.002		0.091	0.000	0.000	0.002			
Kleibergen-Paap LM test statistic		11.267		8.458	17.541	15.098	7.239			
Kleibergen-Paap p-value		0.001		0.004	0.000	0.000	0.007			
Kleibergen-Paap F statistic		14.773		8.746	17.472	18.118	9.678			
Pesaran-Taylor reset statistic		1.934		0.015	0.009	2.624	0.177			
Pesaran-Taylor p-value		0.380		0.902	0.925	0.105	0.674			
Hansen-Sargan test statistic					2.060					
Hansen-Sargan p-value					0.151					

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.18 Preferred expenditure specifications for 2011/12

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	PBC 1	PBC 2	PBC 3	PBC 4	PBC 5	PBC 6	PBC 7	PBC 8	PBC 9
	infectious	cancer	Blood disorders	diabetes	Mental health	LDisability	epilepsy	Vision	hearing problems
	2011/12 spend	2011/12 spend	2011/12 spend	2011/12 spend	2011/12 spend	2011/12 spend	2011/12 spend	2011/12 spend	2011/12 spend
	SYLLR 2011/12/13	SYLLR 2011/12/13	SYLLR 2011/12/13	SYLLR 2011/12/13	SYLLR 2011/12/13	SYLLR 2011/12/13	SYLLR 2011/12/13	SYLLR 2011/12/13	SYLLR 2011/12/13
	spend model	spend model	spend model	spend model	spend model	spend model	spend model	spend model	spend model
	instrument n/a	instrument other needs	instrument n/a	instrument o/need	instrument n/a	instrument n/a	instrument o/need	instrument o/need	instrument n/a
	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted
	OLS	IV second stage GMM2S	OLS	IV second stage GMM2S	OLS	OLS	IV second stage GMM2S	IV second stage GMM2S	OLS
	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality
	actual census 11	actual census11	actual census 11	actual census 11	actual census 11	actual census 11	actual census 11	actual census 11	actual census 11
VARIABLES	10/11 version	10/11 version	10/11 version	10/11 revised	10/11 version	Re-derived, OLS	10/11 revised	10/11 version	Re-derived,OLS2
lLAgall_1112	0.841***	0.961**	0.876***	1.116***	1.194***	0.741*	0.703***	1.279***	1.231***
	[0.266]	[0.384]	[0.248]	[0.133]	[0.212]	[0.398]	[0.177]	[0.241]	[0.395]
lLAhivneedph	0.409***								
	[0.016]								
lSYLLRacExIandP123	0.115								
	[0.207]								
lLAhivneedphSQ	0.075***								
	[0.023]								
lSYLLRacExCancer123		-1.414***							
		[0.292]							
lLACARANneed1112		1.323***							
		[0.423]							
LPROFOCCU11		-0.394***				-0.691***			-0.280
		[0.146]				[0.251]			[0.281]
lSYLLRallcause123			0.060		-0.078	-0.042		-1.090***	0.376
			[0.175]		[0.121]	[0.502]		[0.246]	[0.345]
LBORNEXEU11			0.178***						
			[0.026]						
lSYLLRacExDIA123				-0.415***					
				[0.122]					
LNQUAL17411				0.275***				0.622***	
				[0.065]				[0.079]	
LWHITEEG11				-0.221***					
				[0.044]					
lLAmhneedindexpp					0.338**				
					[0.147]				
LPOPPUCAR11					-0.496***				
					[0.120]				
LPC74LTUN11						-0.609***			
						[0.187]			
lSYLLRacExEPI123							-0.164		
							[0.146]		

lLAepiprev1112							0.531***		
							[0.081]		
LOWNOCC11									0.665***
									[0.209]
Constant	-3.654***	4.919*	-3.419***	-1.452*	-4.244**	-5.250	2.711**	1.685*	-9.391***
	[1.391]	[2.611]	[1.204]	[0.825]	[1.920]	[3.403]	[1.098]	[0.920]	[2.474]
Observations	146	148	148	148	148	137	148	148	148
R-squared	0.773		0.367		0.732	0.128			0.306
Ramsey reset F statistic	1.018		0.705		0.108	0.371			0.594
Probability > F	0.387		0.551		0.955	0.774			0.620
Endogeneity test statistic		18.153		11.094			8.472	9.649	
Endogeneity p-value		0.000		0.001			0.004	0.002	
Hansen-Sargan test statistic		0.103		2.194			1.223	0.023	
Hansen-Sargan p-value		0.748		0.334			0.269	0.879	
Kleibergen-Paap LM test statistic		19.717		34.180			33.862	22.743	
Kleibergen-Paap p-value		0.000		0.000			0.000	0.000	
Kleibergen-Paap F statistic		18.612		66.387			117.471	19.191	
Pesaran-Taylor reset statistic		0.337		2.356			0.250	0.028	
Pesaran-Taylor p-value		0.562		0.125			0.617	0.866	

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.18 continued Preferred expenditure specifications for 2011/12

	(1) PBC 10 circulatory 2011/12 spend SYLLR 2011/12/13 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 11	(2) PBC 11 respiratory 2011/12 spend SYLLR 2011/12/13 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 11	(3) PBC 12 dental problems 2011/12 spend SYLLR 2011/12/13 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 11	(4) PBC 13 gastro problems 2011/12 spend SYLLR 2011/12/13 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 11	(5) PBC 14 skin problems 2011/12 spend SYLLR 2011/12/13 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 11	(6) PBC 15 musculo-skeletal 2011/12 spend SYLLR 2011/12/13 spend model instrument n/a weighted OLS LA-level actual mortality actual census 11	(7) PBC 16 trauma/injuries 2011/12 spend SYLLR 2011/12/13 spend model instrument n/a weighted OLS LA-level actual mortality actual census 11	(8) PBC 17 renal 2011/12 spend SYLLR 2011/12/13 spend model instrument n/a weighted OLS LA-level actual mortality actual census 11	(9) PBC 1819 maternity/neonates 2011/12 spend SYLLR 2011/12/13 spend model instrument n/a weighted OLS LA-level actual mortality actual census 11
VARIABLES	10/11 version	10/11 revised	Re-derived+	10/11 version+	10/11 version+	10/11 version+	10/11 version+	10/11 version	10/11 version OLS
lSYLLRacExResp123		-0.722***							
		[0.213]							
lLAgall_1112	1.491***	1.360***	0.843***	1.033***	0.681***	0.456**	1.024***	0.598***	0.481***
	[0.234]	[0.177]	[0.181]	[0.210]	[0.225]	[0.222]	[0.193]	[0.124]	[0.180]
LNQUAL17411	0.414***	0.392***		0.361***		0.151			
	[0.083]	[0.074]		[0.065]		[0.106]			
lLACARANneed1112SQ		2.439***	-1.260	1.173**					
		[0.562]	[0.789]	[0.541]					
lSYLLRacExCirc123	-1.202***								
	[0.236]								
lSYLLRallcause123			0.107		-0.259	0.215	-0.154		-0.217
			[0.300]		[0.263]	[0.132]	[0.135]		[0.143]
lLAIMD2010			-0.080			0.172			
			[0.081]			[0.114]			
LPROFOCCU11			-0.194						
			[0.122]						
lSYLLRacExGast123				-0.593**					
				[0.254]					
LPC74LTUN11					0.248**	-0.226***			
					[0.099]	[0.077]			
LWHITEEG11					0.215***			-0.124***	
					[0.077]			[0.046]	
LOWNOCC11						0.513***			
						[0.113]			
LHHNOCAR11							-0.147***		
							[0.045]		
lSYLLRacExrenal123								0.088	
								[0.096]	
lLAmatneedindexpp									1.108***
									[0.099]
Constant	1.354	-0.873	-2.750*	0.802	1.193	-1.132	-2.656**	-0.550	2.147**
	[1.022]	[0.777]	[1.531]	[0.834]	[1.652]	[1.368]	[1.111]	[0.563]	[0.858]

Observations	148	148	148	148	145	148	148	148	148
R-squared						0.499	0.242	0.434	0.601
Endogeneity test statistic	22.129	15.086	1.201	6.134	1.993				
Endogeneity p-value	0.000	0.000	0.273	0.013	0.158				
Hansen-Sargan test statistic	0.892	0.027	1.361		1.197				
Hansen-Sargan p-value	0.345	0.870	0.243		0.274				
Kleibergen-Paap LM test statistic	20.617	22.588	24.305	29.448	25.703				
Kleibergen-Paap p-value	0.000	0.000	0.000	0.000	0.000				
Kleibergen-Paap F statistic	19.918	19.840	51.658	94.008	35.963				
Pesaran-Taylor reset statistic	0.545	0.836	2.153	0.127	0.000				
Pesaran-Taylor p-value	0.460	0.360	0.142	0.722	0.992				
Ramsey reset F statistic						1.326	0.561	0.514	1.711
Probability > F						0.268	0.642	0.673	0.168

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.18 continued Preferred expenditure specifications for 2011/12

	(1)	(2)	(3)	(4)
	PBC 20 poisoning 2011/12 spend SYLLR 2011/12/13 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 11	PBC 21 HI 2011/12 spend SYLLR 2011/12/13 spend model instrument n/a weighted OLS LA-level actual mortality actual census 11	PBC 22 social care 2011/12 spend SYLLR 2011/12/13 spend model instrument n/a weighted OLS LA-level actual mortality actual census 11	PBC 23a GMS 2011/12 spend SYLLR 2011/12/13 spend model instrument n/a weighted OLS LA-level actual mortality actual census 11
VARIABLES	10/11 version	10/11 version	10/11 version	10/11 version +
lSYLLRallcause123	-0.206	0.570	-0.698*	-0.096
	[0.286]	[0.388]	[0.400]	[0.103]
lLAgall_1112	0.631**	1.748***	1.859***	0.518***
	[0.297]	[0.515]	[0.532]	[0.113]
LNQUAL17411	0.298***	-0.008		
	[0.090]	[0.240]		
LPROFOCCU11				-0.186***
				[0.065]
Constant	-0.147	-12.970***	-5.898**	1.496**
	[1.023]	[3.136]	[2.922]	[0.719]
Observations	148	147	102	148
R-squared		0.319	0.121	0.430
Endogeneity test statistic	1.908			
Endogeneity p-value	0.167			
Hansen-Sargan test statistic	0.020			
Hansen-Sargan p-value	0.887			
Kleibergen-Paap LM test statistic	22.743			
Kleibergen-Paap p-value	0.000			
Kleibergen-Paap F statistic	19.191			
Pesaran-Taylor reset statistic	0.753			
Pesaran-Taylor p-value	0.385			
Ramsey reset F statistic		0.458	0.864	1.273
Probability > F		0.712	0.462	0.286

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.19 Preferred outcome specifications for 2012/13

	(1) PBC 1 infectious 2012/13 spend SYLLR 2012/13/14 spend model instrument n/a weighted OLS LA-level actual mortality actual census 11	(2) PBC 2 cancer 2012/13 spend SYLLR 2012/13/14 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census11	(3) PBC 4 endocrine etc 2012/13 spend SYLLR 2012/13/14 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 11	(4) PBC 7 neurological etc 2012/13 spend SYLLR 2012/13/14 outcome model instrument n/a weighted OLS LA-level actual mortality actual census 11	(5) PBC 10 circulatory 2012/13 spend SYLLR 2012/13/14 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 11	(6) PBC 11 respiratory 2012/13 spend SYLLR 2012/13/14 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 11	(7) PBC 13 gastro-intestinal 2012/13 spend SYLLR 2012/13/14 outcome model instrument spend weighted IV second stage GMM2S LA-level actual mortality actual census 11	(8) PBC 17 renal 2012/13 spend SYLLR 2012/13/14 outcome model instrument n/a weighted OLS LA-level actual mortality actual census 11	(9) PBC 1819 mat/neonates 2012/13 spend infant m/rate 2012/13/14 outcome model spend exogenous weighted OLS LA-level actual mortality actual census 11
VARIABLES	11/12 version	11/12 version	Re-derived	Re-derived, OLS	11/12 version	11/12 revised	11/12 revised	Re-derived+	11/12 version
lLAg1_1213	-0.362***								
	[0.089]								
lLAhivneedph	0.276***								
	[0.045]								
lLAIMD2010	0.649***		0.579***	0.289***					
	[0.064]		[0.116]	[0.088]					
LLONEPENH11	-0.177								
	[0.183]								
lLAg2_1213		-0.361**							
		[0.149]							
lLACARANneed1213		1.023***			2.304***		3.878***	2.141*	1.926***
		[0.134]			[0.234]		[0.832]	[1.253]	[0.378]
lLAg4_1213			-0.499						
			[0.349]						
LPROFOCCU11			-0.409**					3.875***	
			[0.165]					[1.283]	
lLAg7_1213				-0.009					
				[0.188]					
LBORNEXEU11				-0.169***					0.247***
				[0.050]					[0.064]
lLAg10_1213					-1.464***				
					[0.268]				
lLAg11_1213						-1.704***			
						[0.459]			
LPERMSICK11						6.265***			
						[1.189]			
LPERMSICK11SQ						0.742***			
						[0.166]			
lLAg13_1213							-1.904**		
							[0.897]		
lLACARANneed1213SQ							3.735***		
							[1.352]		
lLAg17_1213								-0.160	

								[0.753]	
LNQUAL17411								3.888***	
								[1.146]	
LWHITEEG11								-3.045***	
								[0.558]	
lLAg1819_1213									-0.106
									[0.129]
LHHNOCAR11									-0.365***
									[0.102]
Constant	0.698	6.744***	1.118	-0.032	11.541***	23.203***	11.547***	9.081*	1.529**
	[0.437]	[0.691]	[1.164]	[0.782]	[1.302]	[3.903]	[4.024]	[4.938]	[0.671]
Observations	147	149	149	149	149	149	149	149	148
R-squared	0.582			0.107				0.233	0.229
Ramsey reset F statistic	1.139			1.414				2.110	1.064
Probability > F	0.336			0.241				0.102	0.366
Endogeneity test statistic		8.481	0.064		30.621	20.193	8.574		
Endogeneity p-value		0.004	0.801		0.000	0.000	0.003		
Kleibergen-Paap LM test statistic		10.435	27.631		24.067	19.742	10.507		
Kleibergen-Paap p-value		0.001	0.000		0.000	0.000	0.001		
Kleibergen-Paap F statistic		11.262	24.515		19.517	16.644	10.363		
Pesaran-Taylor reset statistic		0.408	1.563		0.086	0.096	0.039		
Pesaran-Taylor p-value		0.523	0.211		0.769	0.757	0.843		
Hansen-Sargan test statistic			1.428		0.810	2.227			
Hansen-Sargan p-value			0.490		0.368	0.136			

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.20 Preferred expenditure specifications for 2012/13

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	PBC 1	PBC 2	PBC 3	PBC 4	PBC 5	PBC 6	PBC 7	PBC 8	PBC 9
	infectious	cancer	blood disorders	diabetes	mental health	LDisability	epilepsy	vision	hearing issues
	2011/12 spend	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend
	SYLLR	SYLLR 2012/13/14	SYLLR	SYLLR	SYLLR	SYLLR	all cause SYLLR	SYLLR	SYLLR
	2011/12/13		2012/13/14	2012/13/14	2012/13/14	2012/13/14	2012/13/14	2012/13/14	2012/13/14
	spend model	spend model	spend model	spend model	spend model	spend model	spend model	spend model	spend model
	instrument n/a	instrument o/ need	instrument n/a	instrum o/need	instrument n/a	instrument n/a	instrum o/need	instrum o/need	instrument n/a
	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted	weighted
	OLS	IV second stage GMM2S	OLS	IV second stage GMM2S	OLS	OLS	IV second stage GMM2S	IV second stage GMM2S	OLS
	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality	actual mortality
	actual census 11	actual census11	actual census 11	actual census 11	actual census 11	actual census 11	actual census 11	actual census 11	actual census 11
VARIABLES	11/12 revised	11/12 version	11/12 version	11/12 revised	11/12 version	Re-derived, OLS	11/12 version	11/12 version	11/12 version
lLAgall_1213	0.749***	1.027**	1.119***	0.951***	1.023***	0.000	0.856***	1.411***	1.523***
	[0.252]	[0.522]	[0.253]	[0.128]	[0.221]	[0.451]	[0.168]	[0.234]	[0.357]
lLAhivneedph	0.342***								
	[0.028]								
lSYLLRacExIandP234	0.160								
	[0.193]								
lLAhivneedphSQ	0.087***								
	[0.019]								
LWHITEEG11	-0.303**			-0.243***					
	[0.122]			[0.038]					
lSYLLRacExCancer234		-1.565***							
		[0.326]							
lLACARANneed1213		1.472**							
		[0.599]							
LPROFOCCU11		-0.472***							-0.060
		[0.173]							[0.267]
lSYLLRallcause234			-0.321*		0.043	0.245		-1.047***	0.419
			[0.192]		[0.116]	[0.331]		[0.236]	[0.367]
LBORNEXEU11			0.189***			-0.162***			
			[0.030]			[0.051]			
SYLLRacExDIA234				-0.440***					
				[0.138]					
LNQUAL17411				0.359***				0.607***	
				[0.062]				[0.081]	
lLAmhneedindexpp					0.334**				
					[0.146]				
LPOPPUCAR11					-0.408***				
					[0.116]				
lSYLLRacExEPI234							-0.326**		
							[0.157]		
lLAepiprev1213							0.489***		

							[0.090]		
LOWNOCC11									0.587***
									[0.204]
Constant	-3.303**	5.169	-2.932**	0.056	-3.512*	1.414	2.362**	0.395	-11.656***
	[1.322]	[3.768]	[1.213]	[0.737]	[1.994]	[2.473]	[1.205]	[0.930]	[2.388]
Observations	147	149	149	149	149	135	149	149	149
R-squared	0.788		0.301		0.715	0.081			0.329
Ramsey reset F statistic	2.104		0.196		1.023	0.388			1.093
Probability > F	0.103		0.899		0.384	0.762			0.354
Endogeneity test statistic		28.098		8.114			13.076	9.351	
Endogeneity p-value		0.000		0.004			0.000	0.002	
Hansen-Sargan test statistic		0.008		2.726			0.918	1.707	
Hansen-Sargan p-value		0.929		0.099			0.338	0.191	
Kleibergen-Paap LM test statistic		18.904		28.095			33.802	24.062	
Kleibergen-Paap p-value		0.000		0.000			0.000	0.000	
Kleibergen-Paap F statistic		18.752		43.928			130.353	23.271	
Pesaran-Taylor reset statistic		2.365		1.162			0.643	0.736	
Pesaran-Taylor p-value		0.124		0.281			0.422	0.391	

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.20 continued Preferred expenditure specifications for 2012/13

	(1) PBC 10 circulatory 2012/13 spend SYLLR 2012/13/14 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 11	(2) PBC 11 respiratory 2011/12 spend SYLLR 2011/12/13 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 11	(3) PBC 12 dental problems 2012/13 spend SYLLR 2012/13/14 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 11	(4) PBC 13 gastro problems 2012/13 spend SYLLR 2012/13/14 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 11	(5) PBC 14 skin problems 2012/13 spend SYLLR 2012/13/14 spend model instrument o/need weighted IV second stage GMM2S LA-level actual mortality actual census 11	(6) PBC 15 musculo-skeletal 2012/13 spend SYLLR 2012/13/14 spend model instrument n/a weighted OLS LA-level actual mortality actual census 11	(7) PBC 16 trauma/injuries 2012/13 spend SYLLR 2012/13/14 spend model instrument n/a weighted OLS LA-level actual mortality actual census 11	(8) PBC 17 renal 2012/13 spend SYLLR 2012/13/14 spend model instrument n/a weighted OLS LA-level actual mortality actual census 11	(9) PBC 1819 maternity/neonates 2012/13 spend SYLLR 2012/13/14 spend model instrument n/a weighted OLS LA-level actual mortality actual census 11
VARIABLES	11/12 revised	11/12 version	Re-derived	11/12 version	11/12 revised	11/12 version	11/12 version	11/12 version	11/12 version
lSYLLRacExCirc234	-0.908***								
	[0.159]								
lLAgall_1213	1.285***	0.928***	0.855***	0.997***	1.158***	0.725***	1.058***	0.855***	0.833***
	[0.161]	[0.163]	[0.158]	[0.171]	[0.322]	[0.184]	[0.171]	[0.119]	[0.159]
LNQUAL17411	0.382***	0.408***		0.357***		0.173*			
	[0.078]	[0.071]		[0.076]		[0.094]			
LWHITEEG11	0.191***				0.225*			-0.147***	
	[0.050]				[0.115]			[0.038]	
lSYLLRacExResp234		-0.370*							
		[0.193]							
lLACARANneed1213SQ		1.945***		0.622					
		[0.395]		[0.475]					
lSYLLRallcause234			-0.276*		-0.976*	0.210	-0.270**		-0.472***
			[0.158]		[0.559]	[0.137]	[0.117]		[0.126]
LBORNEXEU11			-0.062***						
			[0.017]						
LLONEPARH11			0.344***						
			[0.083]						
lSYLLRacExGast234				-0.570***					
				[0.218]					
LPC74LTUN11					0.277*	-0.378***			
					[0.158]	[0.076]			
LPROFOCCU11					-0.308*				
					[0.175]				
LOWNOCC11						0.384***			
						[0.103]			
lLAIMD2010						0.136			
						[0.107]			
LHHNOCAR11							-0.129***		
							[0.038]		
lSYLLRacExrenal234								-0.093	
								[0.078]	
lLAmatneedindexpp									1.129***

									[0.083]
Constant	1.110	0.296	0.237	0.942	1.704	-3.635**	-2.230**	-1.375**	1.035
	[0.993]	[0.744]	[1.060]	[0.872]	[2.538]	[1.403]	[0.961]	[0.623]	[0.783]
Observations	149	149	149	149	147	149	149	149	149
R-squared						0.594	0.240	0.505	0.676
Endogeneity test statistic	12.964	6.507	2.711	7.495	4.994				
Endogeneity p-value	0.000	0.011	0.100	0.006	0.025				
Hansen-Sargan test statistic	2.162	0.000	2.463						
Hansen-Sargan p-value	0.141	0.985	0.482						
Kleibergen-Paap LM test statistic	31.331	23.711	43.690	29.937	15.054				
Kleibergen-Paap p-value	0.000	0.000	0.000	0.000	0.000				
Kleibergen-Paap F statistic	65.251	23.538	50.773	122.358	20.121				
Pesaran-Taylor reset statistic	0.807	0.484	0.354	0.023	0.002				
Pesaran-Taylor p-value	0.369	0.487	0.552	0.878	0.964				
Ramsey reset F statistic						0.257	1.071	0.879	0.323
Probability > F						0.856	0.363	0.454	0.809

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.20 continued Preferred expenditure specifications for 2012/13

	(1)	(2)	(3)	(4)
	PBC 20	PBC 21	PBC 22	PBC 23a
	poisoning	HI	social care	GMS
	2012/13 spend	2012/13 spend	2012/13 spend	2012/13 spend
	SYLLR 2012/13/14	SYLLR 2012/13/14	SYLLR 2012/13/14	SYLLR 2012/13/14
	spend model	spend model	spend model	spend model
	instrument o/need	instrument n/a	instrument n/a	instrument n/a
	weighted	weighted	weighted	weighted
	IV second stage	OLS	OLS	OLS
	GMM2S			
	LA-level	LA-level	LA-level	LA-level
	actual mortality	actual mortality	actual mortality	actual mortality
	actual census 11	actual census 11	actual census 11	actual census 11
VARIABLES	11/12 version	11/12 revised	11/12 revised	11/12 version
lSYLLRallcause234	-0.601***	-0.455	-0.852**	-0.113
	[0.229]	[0.488]	[0.408]	[0.088]
lLAgall_1213	1.124***	1.172*	1.613***	0.585***
	[0.252]	[0.645]	[0.430]	[0.095]
LNQUAL17411	0.142			
	[0.111]			
LPC74LTUN11		0.902***		
		[0.312]		
LPROFOCCU11			-0.886***	-0.182***
			[0.246]	[0.063]
Constant	-1.673	1.059	-3.927	1.115*
	[1.280]	[5.485]	[2.680]	[0.654]
Observations	149	149	133	149
R-squared		0.234	0.210	0.474
Endogeneity test statistic	8.286			
Endogeneity p-value	0.004			
Hansen-Sargan test statistic	0.008			
Hansen-Sargan p-value	0.930			
Kleibergen-Paap LM test statistic	24.062			
Kleibergen-Paap p-value	0.000			
Kleibergen-Paap F statistic	23.271			
Pesaran-Taylor reset statistic	1.578			
Pesaran-Taylor p-value	0.209			
Ramsey reset F statistic		0.056	2.080	1.333
Probability > F		0.983	0.106	0.266

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

A2.3 First stage of IV regressions results tables

Table A2.21 First stage of IV regressions, preferred outcome specifications for 2003/04

VARIABLES	(1) PBC 1 Infectious 2003/04 spend SYLLR 2003/04/05 Outcome first-stage regression	(2) PBC 2 Cancer 2003/04 spend SYLLR 2003/04/05 Outcome first-stage regression	(3) PBC 7 Neurological 2003/04 spend SYLLR 2003/04/05 Outcome first-stage regression	(4) PBC 10 Circulatory 2003/04 spend SYLLR 2003/04/05 Outcome first-stage regression	(5) PBC 11 Respiratory 2003/04 spend SYLLR 2003/04/05 Outcome first-stage regression	(6) PBC 13 Gastro-intestinal 2003/04 spend SYLLR 2003/04/05 Outcome first-stage regression	(7) PBC 17 Genito-urinary 2003/04 spend SYLLR 2003/04/05 Outcome first-stage regression
LPROFOCCU03	0.770***						
	[0.246]						
lLAhivneedph	0.027						
	[0.063]						
lLAimd_2007exexpobook	0.625***		0.231**				
	[0.141]		[0.096]				
LWHITEEG03	-0.164				0.364***		0.190
	[0.270]				[0.068]		[0.165]
LPOPPUCAR03	-0.224						
	[0.419]						
LLONEPENH03		0.511***		0.604***		0.512***	
		[0.162]		[0.081]		[0.104]	
LWORKAGRI03		0.020	0.130***				
		[0.022]	[0.022]				
lLAneedCARAN34		0.396**		-0.077	1.185***	-0.640**	1.402***
		[0.175]		[0.229]	[0.120]	[0.295]	[0.202]
LHHNOCAR03			0.498***				
			[0.118]				
LPC74LTUN03			-0.319***				
			[0.101]				
lLAneedCARAN342			1.680**				
			[0.772]				
LPERMSICK03				0.276***		0.449***	
				[0.070]		[0.082]	
LBORNEXEU03							0.090**
							[0.036]
LNQUAL17403							-0.359**
							[0.138]
Constant	1.321	5.263***	2.509***	6.727***	4.034***	6.516***	3.816***
	[1.156]	[0.274]	[0.685]	[0.267]	[0.015]	[0.302]	[0.225]
Observations	144	151	135	151	151	151	151
K-P F statistic	9.795	10.26	10.04	55.86	28.45	24.26	24.69

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.22 First stage of IV regressions, preferred expenditure specifications for 2003/04

VARIABLES	(1) PBC 2 Cancer 2003/04 spend SYLLR 2003/04/05 Expenditure first-stage regression	(2) PBC 8 Vision 2003/04 spend SYLLR 2003/04/05 Expenditure first-stage regression	(3) PBC 9 Hearing 2003/04 spend SYLLR 2003/04/05 Expenditure first-stage regression	(4) PBC 10 Circulatory 2003/04 spend SYLLR 2003/04/05 Expenditure first-stage regression	(5) PBC 11 Respiratory 2003/04 spend SYLLR 2003/04/05 Expenditure first-stage regression	(6) PBC 13 Gastro-intestinal 2003/04 spend SYLLR 2003/04/05 Expenditure first-stage regression	(7) PBC 20 Poisoning 2003/04 spend SYLLR 2003/04/05 Expenditure first-stage regression	(8) PBC 21 Healthy individuals 2003/04 spend SYLLR 2003/04/05 Expenditure first-stage regression
LPERMSICK03		0.254***	0.237***					
		[0.049]	[0.047]					
LNQUAL17403		0.169***	0.224***	0.487***	0.558***	0.148***	0.547***	0.123***
		[0.063]	[0.054]	[0.050]	[0.049]	[0.046]	[0.049]	[0.044]
lLAgall_34netpoppheadOHP	0.875***	0.366***	0.162*	0.631***	0.624***	0.109	0.711***	0.176**
	[0.099]	[0.119]	[0.092]	[0.085]	[0.082]	[0.090]	[0.085]	[0.081]
LLONEPENH03	-0.578***	-0.400***	-0.034	-0.142*			-0.248***	
	[0.086]	[0.061]	[0.063]	[0.082]			[0.080]	
LPOPPUCAR03			-0.414***	-0.347***	-0.559***		-0.388***	
			[0.102]	[0.108]	[0.080]		[0.109]	
LPC74LTUN03			-0.036					
			[0.030]					
LLONEPARH03			0.244***					0.338***
			[0.054]					[0.037]
lLAimd_2007exexpobook			-0.019			0.262***		
			[0.048]			[0.027]		
LPROFOCCU03	-0.522***							
	[0.042]							
lLAneedCARAN34								0.355***
								[0.112]
LWHITEEG03								0.014
								[0.046]
Constant	-2.154***	3.812***	5.587***	1.059*	1.195**	4.757***	0.534	6.022***
	[0.643]	[0.909]	[0.627]	[0.569]	[0.546]	[0.589]	[0.556]	[0.548]
Observations	151	151	151	151	151	151	151	151
K-P F statistic	45.58	35.89	28.34	19.12	48.93	96.40	35.17	19.39

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.23 First stage of IV regressions, preferred outcome specifications for 2004/05

	(1) PBC 2 Cancer 2004/05 spend SYLLR 2004/05/06 Outcome	(2) PBC 4 Endocrine 2004/05 spend SYLLR 2004/05/06 Outcome	(3) PBC 7 Neurological 2004/05 spend SYLLR 2004/05/06 Outcome	(4) PBC 10 Circulatory 2004/05 spend SYLLR 2004/05/06 Outcome	(5) PBC 11 Respiratory 2004/05 spend SYLLR 2004/05/06 Outcome	(6) PBC 13 Gastro-intestinal 2004/05 spend SYLLR 2004/05/06 Outcome
VARIABLES	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression
LLONEPARH04		-0.250***				
		[0.076]				
lLAimd_2007exexpobook		0.261***	0.216**			
		[0.045]	[0.085]			
lLAdiaprev0405		0.118				
		[0.087]				
lLAneedCARAN452		1.021*				
		[0.527]				
LLONEPENH04	0.379**			0.532***		0.464***
	[0.151]			[0.065]		[0.080]
LWORKAGRI04	0.023		0.104***			
	[0.016]		[0.020]			
lLAneedCARAN45	0.522***			0.426**	1.226***	0.807***
	[0.131]			[0.184]	[0.076]	[0.088]
LHHNOCAR04			0.457***			
			[0.100]			
LPC74LTUN04			-0.400***			
			[0.094]			
LPERMSICK04				0.106*		
				[0.062]		
LWHITEEG04					0.227***	
					[0.062]	
Constant	5.183***	2.332***	2.240***	6.187***	4.160***	5.213***
	[0.260]	[0.437]	[0.648]	[0.225]	[0.013]	[0.160]
Observations	151	136	137	151	151	151
K-P F statistic	9.441	10.81	14.11	67.07	13.55	33.42

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.24 First stage of IV regressions, preferred expenditure specifications for 2004/05

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	PBC 2 Cancer 2004/05 spend SYLLR 2004/05/06 Expenditure	PBC 8 Vision 2004/05 spend SYLLR 2004/05/06 Expenditure	PBC 9 Hearing 2004/05 spend SYLLR 2004/05/06 Expenditure	PBC 10 Circulatory 2004/05 spend SYLLR 2004/05/06 Expenditure	PBC 11 Respiratory 2004/05 spend SYLLR 2004/05/06 Expenditure	PBC 13 Gastro-intestinal 2004/05 spend SYLLR 2004/05/06 Expenditure	PBC 20 Poisoning 2004/05 spend SYLLR 2004/05/06 Expenditure
VARIABLES	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression
LPERMSICK04		0.308***	0.254***				
		[0.053]	[0.052]				
LNQUAL17404		0.139**	0.227***	0.493***	0.561***	0.146***	0.552***
		[0.064]	[0.059]	[0.053]	[0.053]	[0.046]	[0.052]
lLAgall_45netpoppheadOHP	0.567***	0.225*	0.127	0.626***	0.624***	0.035	0.692***
	[0.138]	[0.120]	[0.098]	[0.083]	[0.081]	[0.093]	[0.081]
LLONEPENH04	-0.411***	-0.403***	-0.046	-0.137			-0.251***
	[0.108]	[0.061]	[0.065]	[0.089]			[0.085]
LPOPPUCAR04			-0.409***	-0.390***	-0.594***		-0.416***
			[0.095]	[0.118]	[0.078]		[0.116]
LPC74LTUN04			-0.062*				
			[0.037]				
LLONEPARH04			0.249***				
			[0.057]				
LPROFOCCU04	-0.570***						
	[0.046]						
LOWNOCC04	-0.227**						
	[0.087]						
lLAimd_2007exexpobook						0.283***	
						[0.027]	
Constant	0.061	4.860***	5.679***	0.920	1.026*	5.175***	0.490
	[1.035]	[0.959]	[0.786]	[0.591]	[0.582]	[0.628]	[0.568]
Observations	151	151	151	151	151	151	151
K-P F statistic	14.61	41.91	40.25	23.03	58.44	112.8	40.54

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.25 First stage of IV regressions, preferred outcome specifications for 2005/06

	(1) PBC 1 Infectious 2005/06 spend SYLLR 2005/06/07 Outcome	(2) PBC 2 Cancer 2005/06 spend SYLLR 2005/06/07 Outcome	(3) PBC 4 Endocrine 2005/06 spend SYLLR 2005/06/07 Outcome	(4) PBC 7 Neurological 2005/06 spend SYLLR 2005/06/07 Outcome	(5) PBC 10 Circulatory 2005/06 spend SYLLR 2005/06/07 Outcome	(6) PBC 11 Respiratory 2005/06 spend SYLLR 2005/06/07 Outcome	(7) PBC 13 Gastro-intestinal 2005/06 spend SYLLR 2005/06/07 Outcome
VARIABLES	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression
LPROFOCCU05	0.717***						
	[0.164]						
lLAhivneedph	0.243***						
	[0.039]						
lLAhivneedph2	0.170***						
	[0.024]						
lLAimd_2007exexpobook	0.524***		0.243***	0.151			
	[0.095]		[0.043]	[0.111]			
LLONEPENH05		0.320**			0.375***		0.419***
		[0.158]			[0.083]		[0.078]
LWORKAGRI05		0.049**					
		[0.019]					
lLAneedCARAN56		0.754***			0.344	1.254***	0.934***
		[0.117]			[0.251]	[0.077]	[0.096]
LLONEPARH05			-0.241***				
			[0.077]				
lLAdiaprev0506			0.313***				
			[0.080]				
LHHNOCAR05				0.539***	-0.044		
				[0.126]	[0.061]		
LPC74LTUN05				-0.556***			
				[0.114]			
LPOPPUCAR05				3.083			
				[3.779]			
LPOPPUCAR05SQ				0.495			
				[0.801]			
LPERMSICK05					0.198***		
					[0.061]		
LWHITEEG05						0.204***	
						[0.057]	
lLAneedCARAN562						0.117	
						[0.478]	
Constant	2.294***	5.294***	3.176***	6.006	6.120***	4.259***	5.233***
	[0.143]	[0.262]	[0.426]	[4.475]	[0.312]	[0.017]	[0.158]
Observations	149	151	136	136	151	151	151
K-P F statistic	19.09	15.86	9.794	15.14	14.19	12.88	29.08

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.26 First stage of IV regressions, preferred expenditure specifications for 2005/06

VARIABLES	(1) PBC 2 Cancer 2005/06 spend SYLLR 2005/06/07 Expenditure first-stage regression	(2) PBC 8 Vision 2005/06 spend SYLLR 2005/06/07 Expenditure first-stage regression	(3) PBC 10 Circulatory 2005/06 spend SYLLR 2005/06/07 Expenditure first-stage regression	(4) PBC 11 Respiratory 2005/06 spend SYLLR 2005/06/07 Expenditure first-stage regression	(5) PBC 13 Gastro-intestinal 2005/06 spend SYLLR 2005/06/07 Expenditure first-stage regression	(6) PBC 20 Poisoning 2005/06 spend SYLLR 2005/06/07 Expenditure first-stage regression	(7) PBC 21 Healthy individuals 2005/06 spend SYLLR 2005/06/07 Expenditure first-stage regression	(8) PBC 22 Social care 2005/06 spend SYLLR 2005/06/07 Expenditure first-stage regression
LLONEPENH05	-0.393***	-0.395***	-0.145			-0.245***		
	[0.100]	[0.057]	[0.089]			[0.088]		
lLAgall_56netpoppheadOHP	0.601***	0.191*	0.607***	0.604***	0.062	0.659***	0.092	0.116
	[0.125]	[0.106]	[0.079]	[0.075]	[0.086]	[0.076]	[0.081]	[0.122]
LPROFOCCU05	-0.541***							
	[0.045]							
LOWNOCC05	-0.198**							
	[0.085]							
LPERMSICK05		0.314***						0.167***
		[0.055]						[0.058]
LNQUAL17405		0.140**	0.475***	0.543***	0.152***	0.535***	0.216***	0.106
		[0.069]	[0.055]	[0.053]	[0.047]	[0.053]	[0.055]	[0.065]
LPOPPUCAR05			-0.389***	-0.616***		-0.431***	-0.300***	
			[0.134]	[0.081]		[0.129]	[0.105]	
lLAimd_2007exexpobook					0.274***			
					[0.026]			
lLAneedCARAN56							0.505***	
							[0.120]	
LLONEPARH05							0.288***	0.253***
							[0.050]	[0.068]
LWHITEEG05							0.097	
							[0.061]	
LBORNEXEU05							-0.005	
							[0.022]	
LWORKAGRI05							-0.004	
							[0.011]	
LHHNOCAR05								0.049
								[0.047]
Constant	-0.169	5.105***	0.960*	1.031*	4.992***	0.608	5.810***	6.691***
	[0.952]	[0.871]	[0.548]	[0.530]	[0.593]	[0.527]	[0.677]	[0.945]
Observations	151	151	151	151	151	151	151	116
K-P F statistic	15.50	48.81	22.30	57.82	107.3	40.30	50.79	38.22

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.27 First stage of IV regressions, preferred outcome specifications for 2006/07

	(1) PBC 1 Infectious 2006/07 spend SYLLR 2006/07/08 Outcome	(2) PBC 2 Cancer 2006/07 spend SYLLR 2006/07/08 Outcome	(3) PBC 4 Endocrine 2006/07 spend SYLLR 2006/07/08 Outcome	(4) PBC 7 Neurological 2006/07 spend SYLLR 2006/07/08 Outcome	(5) PBC 10 Circulatory 2006/07 spend SYLLR 2006/07/08 Outcome	(6) PBC 11 Respiratory 2006/07 spend SYLLR 2006/07/08 Outcome	(7) PBC 13 Gastro-intestinal 2006/07 spend SYLLR 2006/07/08 Outcome	(8) PBC 18 & 19 Maternity 2006/07 spend SYLLR 2006/07/08 Outcome
VARIABLES	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression
LPROFOCCU06	0.816***			-0.372***	-0.066			0.242
	[0.208]			[0.101]	[0.086]			[0.147]
lLAhivneedph	0.209***							
	[0.042]							
lLAhivneedph2	0.139***							
	[0.025]							
lLAimd_2007exexpobook	0.586***	-0.176*	0.286***	-0.131				-0.044
	[0.118]	[0.091]	[0.046]	[0.132]				[0.217]
LLONEPENH06		0.355***			0.372***		0.362***	
		[0.128]			[0.097]		[0.092]	
lLAneedCARAN67		1.355***			1.190***	0.977***	1.093***	0.938*
		[0.297]			[0.179]	[0.304]	[0.108]	[0.542]
lLAneedCARAN672		0.629						
		[0.671]						
LLONEPARH06			-0.308***					
			[0.100]					
lLAdiaprev0607			0.292***					
			[0.080]					
LHHNOCAR06				0.528***	-0.157***			-0.040
				[0.137]	[0.042]			[0.135]
LPC74LTUN06				-0.394***				0.146
				[0.126]				[0.143]
LPOPPUCAR06				0.582***				
				[0.145]				
LWHITEEG06						0.244***		
						[0.070]		
LPERMSICK06						0.394		
						[0.421]		
LPERMSICK06SQ						0.035		
						[0.067]		
lLAmatneedindexpp								0.752***
								[0.189]
LBORNEXEU06								-0.066
								[0.045]
Constant	2.122***	5.634***	2.798***	4.276***	5.249***	5.078***	5.018***	5.073***
	[0.200]	[0.220]	[0.435]	[0.913]	[0.264]	[0.686]	[0.188]	[1.091]
Observations	148	150	136	117	150	150	149	149
K-P F statistic	15.33	16.38	9.502	7.767	30.49	12.14	15.43	9.216

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.28 First stage of IV regressions, preferred expenditure specifications for 2006/07

VARIABLES	(1) PBC 2 Cancer 2006/07 spend SYLLR 2006/07/08 Expenditure first-stage regression	(2) PBC 8 Vision 2006/07 spend SYLLR 2006/07/08 Expenditure first-stage regression	(3) PBC 10 Circulatory 2006/07 spend SYLLR 2006/07/08 Expenditure first-stage regression	(4) PBC 11 Respiratory 2006/07 spend SYLLR 2006/07/08 Expenditure first-stage regression	(5) PBC 13 Gastro-intestinal 2006/07 spend SYLLR 2006/07/08 Expenditure first-stage regression	(6) PBC 20 Poisoning 2006/07 spend SYLLR 2006/07/08 Expenditure first-stage regression
LPOPPUCAR06	-0.292***		-0.402***	-0.429***		-0.452***
	[0.102]		[0.116]	[0.108]		[0.113]
LLONEPENH06	-0.433***	-0.441***	-0.210***	-0.283***		-0.300***
	[0.089]	[0.051]	[0.076]	[0.071]		[0.073]
lLAgall_67netpoppheadOHP	0.888***	0.327***	0.721***	0.729***	0.148*	0.765***
	[0.093]	[0.114]	[0.085]	[0.081]	[0.089]	[0.084]
LPROFOCCU06	-0.508***					
	[0.057]					
LPERMSICK06		0.276***				
		[0.056]				
LNQUAL17406		0.166**	0.413***	0.449***	0.156***	0.467***
		[0.064]	[0.062]	[0.059]	[0.053]	[0.061]
lLAimd_2007exexpobook					0.263***	
					[0.028]	
Constant	-2.896***	3.930***	-0.127	-0.165	4.395***	-0.438
	[0.595]	[0.963]	[0.605]	[0.569]	[0.615]	[0.588]
Observations	150	150	150	150	150	150
K-P F statistic	46.18	74.59	33.18	56.20	85.71	59.64

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.29 First stage of IV regressions, preferred outcome specifications for 2007/08

	(1) PBC 1 Infectious 2007/08 spend SYLLR 2007/08/09 Outcome	(2) PBC 2 Cancer 2007/08 spend SYLLR 2007/08/09 Outcome	(3) PBC 4 Endocrine 2007/08 spend SYLLR 2007/08/09 Outcome	(4) PBC 10 Circulatory 2007/08 spend SYLLR 2007/08/09 Outcome	(5) PBC 11 Respiratory 2007/08 spend SYLLR 2007/08/09 Outcome	(6) PBC 13 Gastro-intestinal 2007/08 spend SYLLR 2007/08/09 Outcome	(7) PBC 16 Trauma 2007/08 spend SYLLR 2007/08/09 Outcome	(8) PBC 17 Genito-urinary 2007/08 spend SYLLR 2007/08/09 Outcome
VARIABLES	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression
LWHITEEG07	0.322*				0.273***			
	[0.190]				[0.061]			
LPROFOCCU07	0.667***		-0.233***	-0.147				0.363***
	[0.192]		[0.072]	[0.095]				[0.132]
lLAhivneedph	0.339***							
	[0.050]							
lLAhivneedph2	0.174***							
	[0.023]							
lLAimd_2007exexpobook	0.539***	0.024	-0.053					
	[0.098]	[0.097]	[0.057]					
LLONEPENH07		0.630***		0.478***		0.467***		
		[0.134]		[0.097]		[0.110]		
lLAneedCARAN78		0.670**		1.004***	0.785***	1.142***	1.660***	1.418***
		[0.295]		[0.182]	[0.281]	[0.117]	[0.251]	[0.213]
LPERMSICK07			0.212***		1.002**			
			[0.069]		[0.396]			
LHHNOCAR07				-0.101			0.119	
				[0.062]			[0.113]	
LPERMSICK07SQ					0.119**			
					[0.058]			
LWORKAGRI07							0.108***	
							[0.027]	
LPC74LTUN07							-0.264*	
							[0.153]	
lLACKDprev0708								0.155**
								[0.064]
LBORNEXEU07								0.011
								[0.026]
Constant	2.165***	5.705***	4.194***	5.470***	6.204***	5.257***	3.606***	5.201***
	[0.183]	[0.224]	[0.392]	[0.315]	[0.691]	[0.222]	[0.666]	[0.321]
Observations	148	152	133	152	152	151	151	152
K-P F statistic	9.757	19.30	9.375	43.33	20.19	18.14	8.192	6.291

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.30 First stage of IV regressions, preferred expenditure specifications for 2007/08

VARIABLES	(1) PBC 2 Cancer 2007/08 spend SYLLR 2007/08/09 Expenditure first-stage regression	(2) PBC 7 Neurological 2007/08 spend SYLLR 2007/08/09 Expenditure first-stage regression	(3) PBC 8 Vision 2007/08 spend SYLLR 2007/08/09 Expenditure first-stage regression	(4) PBC 10 Circulatory 2007/08 spend SYLLR 2007/08/09 Expenditure first-stage regression	(5) PBC 11 Respiratory 2007/08 spend SYLLR 2007/08/09 Expenditure first-stage regression	(6) PBC 13 Gastro-intestinal 2007/08 spend SYLLR 2007/08/09 Expenditure first-stage regression	(7) PBC 20 Poisoning 2007/08 spend SYLLR 2007/08/09 Expenditure first-stage regression	(8) PBC 22 Social care 2007/08 spend SYLLR 2007/08/09 Expenditure first-stage regression
LLONEPENH07	-0.382***	-0.491***	-0.401***	-0.198***	-0.272***		-0.284***	
	[0.079]	[0.064]	[0.042]	[0.069]	[0.064]		[0.067]	
lLAneedCARAN78		0.737***						
		[0.206]						
lLAgall_78netpoppheadOHP	0.869***	-0.017	0.319**	0.714***	0.723***	0.379***	0.757***	0.522***
	[0.097]	[0.120]	[0.125]	[0.090]	[0.087]	[0.118]	[0.090]	[0.150]
lLAepiprev0708		0.216***						
		[0.067]						
LPERMSICK07		0.164***	0.271***					0.124**
		[0.062]	[0.057]					[0.057]
LPOPPUCAR07	-0.213*			-0.331***	-0.367***	-0.441***	-0.390***	
	[0.111]			[0.122]	[0.115]	[0.109]	[0.119]	
LPROFOCCU07	-0.486***							
	[0.057]							
LNQUAL17407			0.176***	0.387***	0.423***	0.366***	0.440***	0.076
			[0.059]	[0.063]	[0.060]	[0.072]	[0.062]	[0.055]
lLAimd_2007exexpobook						0.136***		
						[0.042]		
LHHNOCAR07								0.015
								[0.043]
LLONEPARH07								0.237***
								[0.063]
Constant	-2.531***	6.763***	4.022***	0.012	-0.065	2.340***	-0.319	3.427***
	[0.614]	[0.891]	[1.061]	[0.629]	[0.609]	[0.852]	[0.629]	[1.205]
Observations	152	152	152	152	152	152	152	110
K-P F statistic	49.41	35	87.35	29.95	54.03	50.77	54.96	14.92

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table A2.31 First stage of IV regressions, preferred outcome specifications for 2008/09

	(1) PBC 1 Infectious 2008/09 spend SYLLR 2008/09/10 Outcome	(2) PBC 2 Cancer 2008/09 spend SYLLR 2008/09/10 Outcome	(3) PBC 4 Endocrine 2008/09 spend SYLLR 2008/09/10 Outcome	(4) PBC 7 Neurological 2008/09 spend SYLLR 2008/09/10 Outcome	(5) PBC 10 Circulatory 2008/09 spend SYLLR 2008/09/10 Outcome	(6) PBC 11 Respiratory 2008/09 spend SYLLR 2008/09/10 Outcome	(7) PBC 13 Gastro-intestinal 2008/09 spend SYLLR 2008/09/10 Outcome
VARIABLES	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression
LPOPPUCAR08	0.963***						
	[0.322]						
LNQUAL17408	-0.589***						
	[0.191]						
LWHITEEG08	0.608***					0.195***	
	[0.172]					[0.075]	
lLAhivneedph	0.511***						
	[0.064]						
lLAhivneedph2	0.193***						
	[0.021]						
lLAimd_2007exexpobook	0.472***	0.004	-0.007				
	[0.106]	[0.076]	[0.074]				
LLONEPENH08		0.597***		0.225**	0.389***		0.423***
		[0.112]		[0.102]	[0.086]		[0.079]
lLAneedCARAN		0.801***		0.559**	1.179***	0.938***	1.103***
		[0.230]		[0.220]	[0.136]	[0.294]	[0.075]
LPERMSICK08			0.307***			1.144**	
			[0.095]			[0.441]	
LPROFOCCU08			-0.198**				
			[0.094]				
lLAepilepsyov18prevrate				0.393**			
				[0.162]			
LOWNOCC08				-0.200			
				[0.127]			
LHHNOCAR08					-0.098*		
					[0.052]		
LLONEPARH08						-0.107	
						[0.082]	
LPERMSICK08SQ						0.139**	
						[0.067]	
Constant	3.107***	5.760***	4.512***	4.691***	5.525***	6.300***	5.223***
	[0.888]	[0.166]	[0.572]	[0.180]	[0.238]	[0.690]	[0.161]
Observations	148	152	149	148	152	151	150
K-P F statistic	10.46	32.48	10.51	10.63	43.47	14.27	28.80

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.32 First stage of IV regressions, preferred expenditure specifications for 2008/09

VARIABLES	(1) PBC 2 Cancer 2008/09 spend SYLLR 2008/09/10 Expenditure first-stage regression	(2) PBC 7 Neurological 2008/09 spend SYLLR 2008/09/10 Expenditure first-stage regression	(3) PBC 8 Vision 2008/09 spend SYLLR 2008/09/10 Expenditure first-stage regression	(4) PBC 10 Circulatory 2008/09 spend SYLLR 2008/09/10 Expenditure first-stage regression	(5) PBC 11 Respiratory 2008/09 spend SYLLR 2008/09/10 Expenditure first-stage regression	(6) PBC 13 Gastro-intestinal 2008/09 spend SYLLR 2008/09/10 Expenditure first-stage regression	(7) PBC 18 & 19 Maternity 2008/09 spend SYLLR 2008/09/10 Expenditure first-stage regression	(8) PBC 20 Poisoning 2008/09 spend SYLLR 2008/09/10 Expenditure first-stage regression
LPOPPUCAR08	-0.296***		-0.365***	-0.319***	-0.149	-0.359***		-0.160
	[0.110]		[0.116]	[0.119]	[0.105]	[0.091]		[0.110]
LLONEPENH08	-0.319***	-0.534***	-0.308***	-0.216***	-0.251***		-0.062	-0.262***
	[0.077]	[0.058]	[0.065]	[0.067]	[0.074]		[0.074]	[0.077]
lLAgall_89netpoppheadOHP	0.275*	0.220*	0.784***	0.745***	-0.005	-0.141	0.439***	0.013
	[0.153]	[0.128]	[0.082]	[0.081]	[0.117]	[0.112]	[0.134]	[0.123]
lLAneedCARAN	0.880***	0.855***			1.222***	1.227***		1.259***
	[0.197]	[0.138]			[0.130]	[0.214]		[0.136]
LPROFOCCU08	-0.329***							
	[0.058]							
lLAepilepsyov18prevrate		0.256***						
		[0.053]						
LNQUAL17408			0.420***	0.369***				
			[0.057]	[0.057]				
lLAneedCARAN2					0.128			
					[0.292]			
lLAimd_2007exexpobook						0.045	0.213***	
						[0.048]	[0.048]	
LWHITEEG08							0.241***	
							[0.059]	
lLAmatneedindexpp							0.297***	
							[0.088]	
Constant	1.887*	3.412***	-0.588	-0.305	5.193***	6.085***	2.109**	5.057***
	[1.133]	[0.960]	[0.589]	[0.588]	[0.835]	[0.800]	[0.907]	[0.879]
Observations	152	150	152	152	152	152	152	152
K-P F statistic	56.43	82.27	51.87	29.65	34.27	22.22	11.22	33.86

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.33 First stage of IV regressions, preferred outcome specifications for 2009/10

	(1) PBC 1 Infectious 2009/10 spend SYLLR 2009/10/11 Outcome	(2) PBC 2 Cancer 2009/10 spend SYLLR 2009/10/11 Outcome	(3) PBC 4 Endocrine 2009/10 spend SYLLR 2009/10/11 Outcome	(4) PBC 7 Neurological 2009/10 spend SYLLR 2009/10/11 Outcome	(5) PBC 10 Circulatory 2009/10 spend SYLLR 2009/10/11 Outcome	(6) PBC 11 Respiratory 2009/10 spend SYLLR 2009/10/11 Outcome	(7) PBC 13 Gastro-intestinal 2009/10 spend SYLLR 2009/10/11 Outcome	(8) PBC 17 Genito-urinary 2009/10 spend SYLLR 2009/10/11 Outcome
VARIABLES	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression
LPOPPUCAR09	1.037***							
	[0.301]							
LNQUAL17409	-0.713***							
	[0.201]							
LWHITEEG09	0.578***					-0.080		-0.124
	[0.147]					[0.053]		[0.089]
LWORKAGRI09	0.062*							-0.036***
	[0.034]							[0.012]
lLAhivneedph	0.535***							
	[0.062]							
lLAhivneedphSQ	0.141***							
	[0.025]							
lLAIMD2010	0.564***	-0.042	-0.020					
	[0.099]	[0.057]	[0.081]					
LLONEPENH09		0.313***			0.373***		0.186***	
		[0.088]			[0.118]		[0.064]	
lLACARANneed910		0.792***		0.389**	0.851***	0.306	0.988***	1.011***
		[0.159]		[0.195]	[0.146]	[0.239]	[0.072]	[0.188]
LPERMSICK09			0.427***			1.779***		
			[0.103]			[0.410]		
LPROFOCCU09			0.034					0.320***
			[0.102]					[0.110]
LOWNOCC09				-0.349***				-0.063
				[0.109]				[0.105]
lLAepiprev0910				0.545***				
				[0.137]				
LBORNEXEU09				-0.012				
				[0.028]				
LHHNOCAR09					0.009			
					[0.059]			
LLONEPARH09						-0.282***		
						[0.069]		
LPERMSICK09SQ						0.204***		
						[0.062]		
lLACARANneed910SQ							0.711*	
							[0.426]	
lLACKDprev18								0.071
								[0.064]
Constant	3.367***	5.445***	5.346***	6.779***	5.705***	7.233***	4.823***	4.796***
	[0.757]	[0.133]	[0.599]	[0.674]	[0.315]	[0.677]	[0.133]	[0.246]
Observations	147	150	148	140	150	148	148	150
K-P F statistic	8.698	17.79	17.22	10.20	10.90	9.051	8.446	19.95

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.34 First stage of IV regressions, preferred expenditure specifications for 2009/10

	(1) PBC 2 Cancer 2009/10 spend SYLLR 2009/10/11	(2) PBC 4 Endocrine 2009/10 spend SYLLR 2009/10/11	(3) PBC 7 Neurological 2009/10 spend SYLLR 2009/10/11	(4) PBC 8 Vision 2009/10 spend SYLLR 2009/10/11	(5) PBC 10 Circulatory 2009/10 spend SYLLR 2009/10/11	(6) PBC 11 Respiratory 2009/10 spend SYLLR 2009/10/11	(7) PBC 13 Gastro-intestinal 2009/10 spend SYLLR 2009/10/11	(8) PBC 18 & 19 Maternity 2009/10 spend SYLLR 2009/10/11	(9) PBC 20 Poisoning 2009/10 spend SYLLR 2009/10/11
VARIABLES	Expenditure first-stage regression	Expenditure first-stage regression	Expenditure first-stage regression	Expenditure first-stage regression	Expenditure first-stage regression	Expenditure first-stage regression	Expenditure first-stage regression	Expenditure first-stage regression	Expenditure first-stage regression
LLONEPENH09	-0.159*	-0.138*	-0.498***	-0.190**	-0.051	-0.123*		-0.078	-0.140*
	[0.082]	[0.079]	[0.059]	[0.074]	[0.072]	[0.068]		[0.072]	[0.072]
LPOPPUCAR09	-0.402***	-0.315**		-0.297**	-0.303***	-0.317***	-0.263**		-0.314***
	[0.123]	[0.123]		[0.132]	[0.109]	[0.102]	[0.101]		[0.105]
lLAgall_0910pheadOHP	0.009	-0.293**	0.219*	0.711***	-0.192*	-0.280**	-0.338***	0.130	-0.233**
	[0.153]	[0.121]	[0.125]	[0.072]	[0.116]	[0.117]	[0.113]	[0.087]	[0.112]
lLACARANneed910	1.114***	1.468***	0.678***		1.279***	1.392***	1.026***		1.396***
	[0.215]	[0.140]	[0.149]		[0.135]	[0.131]	[0.197]		[0.130]
lLACARANneed910SQ		0.566*				0.537*			
		[0.302]				[0.275]			
lLAdiaprev0910		-0.027							
		[0.062]							
LPROFOCCU09	-0.263***								
	[0.062]								
lLAepiprev0910			0.326***						
			[0.065]						
LNQUAL17409				0.403***					
				[0.055]					
lLAIMD2010							0.138***	0.341***	
							[0.044]	[0.034]	
LWHITEEG09								0.357***	
								[0.042]	
lLAmatneedindexpp								0.194***	
								[0.070]	
Constant	3.944***	7.081***	4.927***	0.213	6.422***	7.052***	7.446***	3.919***	6.730***
	[1.103]	[0.811]	[0.841]	[0.531]	[0.789]	[0.789]	[0.760]	[0.632]	[0.767]
Observations	150	148	140	150	150	148	148	150	150
K-P F statistic	27.74	23.10	55.10	17.74	11.76	22.22	29.99	69.22	21.30

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.35 First stage of IV regressions, preferred outcome specifications for 2010/11

	(1) PBC 1 Infectious 2010/11 spend SYLLR 2010/11/12 Outcome	(2) PBC 2 Cancer 2010/11 spend SYLLR 2010/11/12 Outcome	(3) PBC 7 Neurological 2010/11 spend SYLLR 2010/11/12 Outcome	(4) PBC 10 Circulatory 2010/11 spend SYLLR 2010/11/12 Outcome	(5) PBC 11 Respiratory 2010/11 spend SYLLR 2010/11/12 Outcome	(6) PBC 13 Gastro-intestinal 2010/11 spend SYLLR 2010/11/12 Outcome	(7) PBC 17 Genito-urinary 2010/11 spend SYLLR 2010/11/12 Outcome	(8) PBC 18 & 19 Maternity 2010/11 spend SYLLR 2010/11/12 Outcome
VARIABLES	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression
LNQUAL17410	-0.506***						0.209**	
	[0.151]						[0.080]	
lLACARANneed1011	1.453***	0.861***	0.822***	0.709***		1.110***		-0.175
	[0.373]	[0.282]	[0.107]	[0.125]		[0.152]		[0.210]
lLAhivneedph	0.368***							
	[0.039]							
lLAIMD2010	0.124	-0.061						
	[0.131]	[0.111]						
LLONEPENH10		0.465***		0.146				
		[0.128]		[0.095]				
LWHITEEG10			0.231***				-0.093	
			[0.057]				[0.087]	
LHHNOCAR10				-0.125**				0.188***
				[0.056]				[0.063]
LLONEPARH10					-0.239***			
					[0.072]			
LPERMSICK10					2.703***			
					[0.488]			
LPERMSICK10SQ					0.343***			
					[0.076]			
LPC74LTUN10						-0.205***		
						[0.069]		
lLACARANneed1011SQ						1.789***		
						[0.662]		
LWORKAGRI10							-0.055***	
							[0.016]	
LPOPPUCAR10							0.227	
							[0.168]	
lLAmatneedindexpp								0.796***
								[0.163]
LBORNEXEU10								-0.011
								[0.040]
Constant	2.229***	5.799***	4.380***	5.015***	8.864***	3.540***	4.936***	4.640***
	[0.500]	[0.192]	[0.019]	[0.260]	[0.761]	[0.298]	[0.297]	[0.089]
Observations	147	150	150	150	150	150	152	149
K-P F statistic	9.561	25.02	16.65	12.59	10.90	8.704	11.41	23.73

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.36 First stage of IV regressions, preferred expenditure specifications for 2010/11

	(1) PBC 2 Cancer 2010/11 spend SYLLR 2010/11/12 Expenditure first-stage regression	(2) PBC 4 Endocrine 2010/11 spend SYLLR 2010/11/12 Expenditure first-stage regression	(3) PBC 6 Learning Disability 2010/11 spend SYLLR 2010/11/12 Expenditure first-stage regression	(4) PBC 7 Neurological 2010/11 spend SYLLR 2010/11/12 Expenditure first-stage regression	(5) PBC 8 Vision 2010/11 spend SYLLR 2010/11/12 Expenditure first-stage regression	(6) PBC 10 Circulatory 2010/11 spend SYLLR 2010/11/12 Expenditure first-stage regression	(7) PBC 11 Respiratory 2010/11 spend SYLLR 2010/11/12 Expenditure first-stage regression	(8) PBC 13 Gastro-intestinal 2010/11 spend SYLLR 2010/11/12 Expenditure first-stage regression	(9) PBC 14 Skin 2010/11 spend SYLLR 2010/11/12 Expenditure first-stage regression	(10) PBC 18 & 19 Maternity 2010/11 spend SYLLR 2010/11/12 Expenditure first-stage regression	(11) PBC 20 Poisoning 2010/11 spend SYLLR 2010/11/12 Expenditure first-stage regression
VARIABLES											
LLONEPENH10	-0.126	-0.265***	-0.290***	-0.255***	-0.165**		-0.157**		-0.349***	-0.049	-0.165**
	[0.083]	[0.059]	[0.058]	[0.064]	[0.070]		[0.068]		[0.059]	[0.072]	[0.070]
lLAIMD2010		0.240***	0.227***	0.265***		0.132***		0.251***		0.345***	
		[0.038]	[0.044]	[0.041]		[0.037]		[0.029]		[0.033]	
LPROFOCCU10	-0.261***	-0.354***	-0.212***			-0.241**			-0.388***		
	[0.061]	[0.071]	[0.049]			[0.102]			[0.048]		
lLAgall_1011pheadOHP	0.035	0.301***	-0.020	0.197***	0.733***	0.418***	0.688***	0.185**	0.673***	0.124	0.733***
	[0.155]	[0.091]	[0.125]	[0.073]	[0.069]	[0.100]	[0.065]	[0.078]	[0.093]	[0.083]	[0.069]
LNQUAL17410		-0.643**			0.405***	-0.013	0.390***	0.140***			0.405***
		[0.270]			[0.054]	[0.088]	[0.052]	[0.029]			[0.054]
LNQUAL17410SQ		-0.169**									
		[0.083]									
LWHITEEG10		0.319***	0.287***						0.344***	0.350***	
		[0.037]	[0.038]						[0.062]	[0.039]	
LPOPPUCAR10	-0.429***			-0.165*	-0.345***		-0.315**				-0.345***
	[0.121]			[0.087]	[0.130]		[0.124]				[0.130]
lLACARANneed1011	1.126***		0.408**								
	[0.212]		[0.183]								
LWORKAGRI10			-0.025***								
			[0.008]								
LPC74LTUN10			-0.079	-0.049					0.058		
			[0.053]	[0.048]					[0.047]		
lLAepiprev1011				0.502***							
				[0.055]							
LBORNEXEU10									0.044**		
									[0.018]		
lLAmatneedindexpp										0.212***	
										[0.072]	
Constant	3.806***	1.632**	4.285***	5.148***	0.046	2.042**	0.396	4.097***	0.279	4.091***	0.046
	[1.148]	[0.804]	[1.008]	[0.569]	[0.508]	[0.791]	[0.489]	[0.531]	[0.922]	[0.593]	[0.508]
Observations	150	150	137	150	150	150	150	150	147	150	150
K-P F statistic	30.07	56.66	20.44	22.77	18.70	20.27	17.31	73.90	23.61	75.02	18.70

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.37 First stage of IV regressions, preferred outcome specifications for 2011/12

	(1) PBC 2 Cancer 2011/12 spend SYLLR 2011/12/13 Outcome	(2) PBC 7 Neurological 2011/12 spend SYLLR 2011/12/13 Outcome	(3) PBC 10 Circulatory 2011/12 spend SYLLR 2011/12/13 Outcome	(4) PBC 11 Respiratory 2011/12 spend SYLLR 2011/12/13 Outcome	(5) PBC 13 Gastro-intestinal 2011/12 spend SYLLR 2011/12/13 Outcome
VARIABLES	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression
lLACARANneed1112	0.716***	0.647***	0.600***		1.082***
	[0.128]	[0.219]	[0.114]		[0.081]
LWORKAGRI11		-0.020			
		[0.015]			
lLAIMD2010		-0.065			
		[0.063]			
lLAepiprev1112		0.466***			
		[0.104]			
LLONEPENH11	0.328***		0.390***		
	[0.085]		[0.088]		
LHHNOCAR11			0.025		-0.092***
			[0.044]		[0.030]
LLONEPARH11				-0.257***	
				[0.060]	
LPERMSICK11				2.057***	
				[0.389]	
LPERMSICK11SQ				0.241***	
				[0.060]	
lLACARANneed1112SQ					0.719
					[0.481]
Constant	5.329***	6.729***	5.731***	7.848***	4.321***
	[0.187]	[0.461]	[0.236]	[0.639]	[0.049]
Observations	148	148	148	148	148
K-P F statistic	14.77	8.746	17.47	18.12	9.678

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.38 First stage of IV regressions, preferred expenditure specifications for 2011/12

VARIABLES	(1) PBC 2 Cancer 2011/12 spend SYLLR 2011/12/13 Expenditure first-stage regression	(2) PBC 4 Endocrine 2011/12 spend SYLLR 2011/12/13 Expenditure first-stage regression	(3) PBC 7 Neurological 2011/12 spend SYLLR 2011/12/13 Expenditure first-stage regression	(4) PBC 8 Vision 2011/12 spend SYLLR 2011/12/13 Expenditure first-stage regression	(5) PBC 10 Circulatory 2011/12 spend SYLLR 2011/12/13 Expenditure first-stage regression	(6) PBC 11 Respiratory 2011/12 spend SYLLR 2011/12/13 Expenditure first-stage regression	(7) PBC 12 Dental 2011/12 spend SYLLR 2011/12/13 Expenditure first-stage regression	(8) PBC 13 Gastro-intestinal 2011/12 spend SYLLR 2011/12/13 Expenditure first-stage regression	(9) PBC 14 Skin 2011/12 spend SYLLR 2011/12/13 Expenditure first-stage regression	(10) PBC 20 Poisoning 2011/12 spend SYLLR 2011/12/13 Expenditure first-stage regression
LLONEPENH11	-0.086	-0.246***	-0.246***	-0.148*		-0.127*	-0.244***		-0.385***	-0.148*
	[0.094]	[0.061]	[0.061]	[0.082]		[0.075]	[0.054]		[0.062]	[0.082]
lLAIMD2010		0.252***	0.252***		0.131***		0.276***	0.264***		
		[0.041]	[0.041]		[0.042]		[0.040]	[0.027]		
LPROFOCCU11	-0.351***	-0.362***	-0.362***		-0.206*		-0.253***		-0.362***	
	[0.058]	[0.063]	[0.063]		[0.107]		[0.045]		[0.043]	
lLAgall_1112pheadOHP	0.085	0.180**	0.180**	0.719***	0.400***	0.655***	0.115	0.095	0.592***	0.719***
	[0.185]	[0.087]	[0.087]	[0.072]	[0.122]	[0.066]	[0.083]	[0.083]	[0.076]	[0.072]
LNQUAL17411		-0.114	-0.114	0.420***	0.044	0.430***		0.187***		0.420***
		[0.075]	[0.075]	[0.055]	[0.092]	[0.054]		[0.032]		[0.055]
LWHITEEG11		0.354***	0.354***				0.318***		0.288***	
		[0.038]	[0.038]				[0.032]		[0.043]	
LPOPPUCAR11	-0.389***			-0.364***		-0.360***				-0.364***
	[0.144]			[0.138]		[0.133]				[0.138]
lLACARANneed1112	1.025***									
	[0.242]									
lLACARANneed1112SQ						0.910***	0.820***	1.106***		
						[0.344]	[0.299]	[0.288]		
LPC74LTUN11									0.094**	
									[0.044]	
Constant	3.477***	2.909***	2.909***	0.147	2.282**	0.623	3.610***	4.760***	0.844	0.147
	[1.328]	[0.645]	[0.645]	[0.534]	[0.964]	[0.480]	[0.598]	[0.575]	[0.786]	[0.534]
Observations	148	148	148	148	148	148	148	148	145	148
K-P F statistic	18.61	66.39	117.5	19.19	19.92	19.84	51.66	94.01	35.96	19.19

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.39 First stage of IV regressions, preferred outcome specifications for 2012/13

	(1) PBC 2 Cancer 2012/13 spend SYLLR 2012/13/14 Outcome	(2) PBC 4 Endocrine 2012/13 spend SYLLR 2012/13/14 Outcome	(3) PBC 10 Circulatory 2012/13 spend SYLLR 2012/13/14 Outcome	(4) PBC 11 Respiratory 2012/13 spend SYLLR 2012/13/14 Outcome	(5) PBC 13 Gastro-intestinal 2012/13 spend SYLLR 2012/13/14 Outcome
VARIABLES	first-stage regression	first-stage regression	first-stage regression	first-stage regression	first-stage regression
LWHITEEG11		-0.389***			
		[0.060]			
lLACARANneed1213	0.743***	0.870***	0.847***		0.817***
	[0.142]	[0.190]	[0.119]		[0.082]
LNQUAL17411		0.445***			
		[0.104]			
lLAIMD2010		-0.051			
		[0.056]			
LPROFOCCU11		0.360***			
		[0.102]			
LLONEPENH11	0.342***		0.203**		0.214***
	[0.102]		[0.100]		[0.066]
LHHNOCAR11			-0.116**		
			[0.045]		
LPOPPUCAR11				0.449***	
				[0.094]	
LLONEPARH11				0.012	
				[0.076]	
LPERMSICK11				1.797***	
				[0.339]	
LPERMSICK11SQ				0.229***	
				[0.052]	
lLACARANneed1213SQ					0.310
					[0.434]
Constant	5.382***	5.190***	5.122***	8.924***	4.939***
	[0.225]	[0.252]	[0.260]	[0.635]	[0.138]
Observations	149	149	149	149	149
K-P F statistic	11.26	24.51	19.52	16.64	10.36

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A2.40 First stage of IV regressions, preferred expenditure specifications for 2012/13

VARIABLES	(1) PBC 2 Cancer 2012/13 spend SYLLR 2012/13/14 Expenditure first-stage regression	(2) PBC 4 Endocrine 2012/13 spend SYLLR 2012/13/14 Expenditure first-stage regression	(3) PBC 7 Neurological 2012/13 spend SYLLR 2012/13/14 Expenditure first-stage regression	(4) PBC 8 Vision 2012/13 spend SYLLR 2012/13/14 Expenditure first-stage regression	(5) PBC 10 Circulatory 2012/13 spend SYLLR 2012/13/14 Expenditure first-stage regression	(6) PBC 11 Respiratory 2012/13 spend SYLLR 2012/13/14 Expenditure first-stage regression	(7) PBC 12 Dental 2012/13 spend SYLLR 2012/13/14 Expenditure first-stage regression	(8) PBC 13 Gastro-intestinal 2012/13 spend SYLLR 2012/13/14 Expenditure first-stage regression	(9) PBC 14 Skin 2012/13 spend SYLLR 2012/13/14 Expenditure first-stage regression	(10) PBC 20 Poisoning 2012/13 spend SYLLR 2012/13/14 Expenditure first-stage regression
LPOPPUCAR11	-0.404***		-0.292***	-0.467***		-0.451***				-0.467***
	[0.128]		[0.071]	[0.124]		[0.117]				[0.124]
LLONEPENH11	-0.074	-0.355***		-0.093		-0.075			-0.286***	-0.093
	[0.090]	[0.063]		[0.082]		[0.074]			[0.064]	[0.082]
lLAgall_1213pheadOHP	-0.119	0.650***	0.032	0.693***	0.055	0.636***	-0.005	0.044	0.499***	0.693***
	[0.230]	[0.055]	[0.082]	[0.073]	[0.094]	[0.065]	[0.093]	[0.078]	[0.071]	[0.073]
lLACARANneed1213	1.259***									
	[0.289]									
LPROFOCCU11	-0.366***	-0.530***			-0.277***		-0.208***		-0.362***	
	[0.063]	[0.074]			[0.067]		[0.039]		[0.042]	
LNQUAL17411		-0.072		0.492***	-0.091	0.495***		0.245***		0.492***
		[0.079]		[0.052]	[0.070]	[0.050]		[0.031]		[0.052]
LWHITEEG11		0.241***			0.313***		0.252***		0.276***	
		[0.066]			[0.042]		[0.041]		[0.048]	
lLAIMD2010			0.300***		0.318***		0.287***	0.274***		
			[0.025]		[0.041]		[0.049]	[0.025]		
lLAepiprev1213			0.531***							
			[0.048]							
lLACARANneed1213SQ						0.802**	0.807***	1.035***		
						[0.317]	[0.293]	[0.257]		
LBORNEXEU11							-0.000			
							[0.015]			
LLONEPARH11							0.140***			
							[0.053]			
LPC74LTUN11									0.163***	
									[0.042]	
Constant	4.972***	-0.252	6.825***	0.300	4.068***	0.738	5.393***	5.186***	2.008***	0.300
	[1.674]	[0.451]	[0.634]	[0.546]	[0.687]	[0.477]	[0.574]	[0.544]	[0.738]	[0.546]
Observations	149	149	149	149	149	149	149	149	147	149
K-P F statistic	18.75	43.93	130.4	23.27	65.25	23.54	50.77	122.4	20.12	23.27

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1